THE RAILWAY REVIEW

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Sunday Trains in Scotland.—The only Sunday train on the Great North of Scotland Railway is the one which plies between Aberdeen and Ballater when the court is at Balmoral Castle. The Glasgow and South Western, Caledonian, and Highland Companies confine their Sunday work exclusively to mail trains, while the North British run ordinary passenger trains as well, on the first day of the week, and it is the suppression of the latter that the Sabbath Observance Committees across the border are presently aiming at, with a view of extending a day of rest amongst the employes. This movement so far as regards the North British Railway, is a very old story, dating as it does back to the early days of the line.

Boats of Large Carrying Capacity.—There is now practically no doubt of all of the Rockefeller ships carrying full 4,000 gross tons from Lake Superior on the present draft of about 14 ft. 4 in., says the Marine Review. The first of these ships, the Sir Henry Bessemer, has just delivered at Cleveland from Ashland 4,051 gross, or 4,537 net tons, which is the largest cargo of any kind ever moved from Lake Superior. But 4,000-ton cargoes will be small next season, when dredging operations throughout the rivers afford to vessels of this kind of draft of water equal to the greatest depth that can be had at Lake Erie ports. Predictions in this regard might be wide of the mark just now, but it is certainly reasonable to expect that 6,000-ton loads will be as common next year as those of 4,000 tons are at present. The barge Aurania, owned by John Corrigan, of Cleveland, has again taken first place among the steel tow barges in the Lake Superior trade. She is now bound down from Duluth with 4,034 gross, or 4,520 net tons of ore.

Tests of a Teredo Proof Pile.—The board of harbor commissioners of San Francisco believes that it has at last found a pile that will withstand the ravages of the voracious teredo. A teredo proof pile driven in October, 1886, and an ordinary fir pile driven in April, 1894, were both recently taken up. The common pile was so badly damaged by the inroads of the teredo after having been down but two years that, when laid on the wharf, in broke in two with its own weight, while the teredo proof pile, which had been driven for nine years and six months, was found to be nearly or quite as sound as when it was first driven. The construction of this pile is simple. In the center is a piece of timber 6 in. sq., about which are secured strips or boards secured alternately at right angles to each other until the proper thickness of diameter for the pile has been reached. In building the pile the center core is first smeared with a preservative compound made of either asphaltum, coal tar, or a similar substance that prevents the decay of wood. The strips are then nailed on opposite sides of the core, being first coated with the preservative compound. The outer surface of the completed pile is protected by an exterior coating or layer of the preservative compound.

Railroading in Jamaica.—A young Englishman just arrived from Jamaica, who has secured a position on the Pittsburgh Junction Railroad and who spent seven years railroading in the West Indies, recently delivered a a lecture before the members of Division No. 52, Order Railway Telegraphers, and told them all about the railroads of Jamaica. He says the ordinary run of telegraph operators in that country get about $2.50 per week. He worked as operator for the Jamaica Railroad Company at Cadupa station, and was at the same time agent for the West India Improvement Company, and commanded a salary of from $50 to $55, and was considered a millionaire by his less fortunate fellow workmen. He says all the crews on the roads are made up of blacks, and he knew of but one white man holding a job on the trains. The coaches are of the English type, and many of the locomotives also, but there are quite a number of American locomotives on the line. They have the tracks entirely fenced in, and many other arrangements to prevent accidents. In addition to the telegraph they have a telephone line connecting with every station, which is used extensively and saves the expense of an operator at many places. If an operator is negligent or makes a mistake, causing a delay of trains, he is fined according to the nature of his error and its consequences, and to this system of discipline the men are very much opposed, as they are often compelled to pay fines for delays that result from causes not traceable to any negligence on their part.

The Bergen Railway, Norway.—The Bergen Railway in Norway has been discussed for a number of years, and various plans have been at different times brought forward; it was only after a protracted debate that the Storthing in 1894 decided upon the line. According to Engineering the works are now, however, in full progress and are attended with more engineering difficulties than have hitherto been met with in railroad construction in Scandinavia. One of the most interesting features is a tunnel 17,570 ft. long. A great amount of preparatory work has, of course, been necessary, and no small portion of this has had reference to the snow question, which has been exhaustively examined during several winters. Both the distribution of the snow and the quantity in the different localities vary considerably from year to year. In some winters the depth of snow averages 3 ft. or 4 ft., whilst in others it is more than 6 ft. On the more exposed spots there is generally but little snow, whilst in hollows it may be 12 ft. to 16 ft. deep. The Voss-Tangevand section (about 46½ miles) rises from a minimum of 180 ft. to a maximum hight above the level of the sea of 4,330 ft. This section will entail an expenditure of about $4,000,000, of which $750,000 will be required for the Gravelhalsen tunnel, the construction of which has been contracted for by a firm of Norwegian engineers. The works on the west side of this tunnel were commenced last autumn, and the rock has so far principally consisted of a hard slate. Operations are now about to begin at the other end of this tunnel, the completion of which is fixed for October 1, 1903. At both ends water power is available for the working of of boring machines, ventilators, etc. A large portion of that section lies above the forest boundary. The Bergen line will no doubt prove both of great commercial value and of special interest to tourists.

English Rails Abroad.—The railway extension policy adopted by the Anglo-Indian government is having a great effect upon the external demand for English rails. Japan and the Argentine Republic are also importing British rails upon a large scale, the result being that English rail exports in all directions in June were 60,533 tons, as compared with 37,870 tons in June, 1895, and 37,022 tons in June, 1894. The aggregate exports in the first half of this year were 288,683 tons, as compared with 170,194 tons in the first half of 1895, and 161,986 tons in the first half of 1894. In these latter totals the exports to British India figured for 139,473 tons, as compared with 61,417 tons and 73,313 tons; those to the Argentine Republic, for 40,043 tons, as compared with 2,658 tons and 5,785 tons; and those to Japan, for 34,113 tons as compared with 18,828 tons and 21,400 tons. The deliveries of British rails to Australasia to June 30 this year were 30,337 tons as compared with 20,983 tons in the corresponding period of 1895, and 17,559 tons in the corresponding period of 1894. The increased attention which is being now devoted to Antipodean gold mining has contributed, of course, to this last mentioned result.

Communication on Board a Ship.—When a war ship is steaming at high pressure, and the weather is at all rough, some difficulty has been experienced in communicating promptly and effectually between the bridge and engine room, as well as between other parts of the ship. The admiralty are now taking steps to have this difficulty removed. The service voice-pipe has long been condemned as a source of worry to all who have been called upon to use it, and the admiralty have prudently hesitated before introducing the telephone except in such parts of a ship as are not disturbed by the rattle of machinery or affected by electric currents. The Naval and Military Record says that during last year's maneuvers the Homocoustic voice-pipe was tried on the cruiser Fox, and although it was not a success at first, it was found that when three seamen from the deck and three stokers from the engine room had become acquainted with each others' voices the sound could be distinctly heard. The apparatus has now been so improved as to absolutely insulate the sound, and it has been fitted with satisfactory results in the torpedo boat destroyers.

Navigation on the Amoor.—In an article on the Trans-Siberian Railway, in which Th. Sabachnikoff and Ed. Levat relate their experience, the authors also discuss the navigation on the Amoor, the powerful but shallow river which for more than 2,000 miles forms the frontier between Manchooria and Russia. The upper Amoor and its tributary, the Chika, are navigable in a measure from Stretinsk, the terminus of the Transbaikal line, the most difficult section of the Siberian Railway, down to Blagovietchensk, a distance of about 750 miles; not more than 3 ft. of water can be reckoned upon an average. Blagovietchensk, a few decades ago a heap of huts in the forest, is now an up to date town, with blocks after the American plan, electric light, a theater, and a Pasteur institute. The middle Amoor reaches down to Khabarovsk, another 500 miles; the depth varies between 4 and 6 ft. The lower Amoor, 1,200 miles down to the mouth at Nicolaievsk, is very much wider, often swelling to immense lakes, but only navigable for vessels of about 5 ft. draft. Navigation is open from the end of April to the beginning or end of October. There are at present 52 steamers of a total of 3,000 horse power, all of which, even the mail boats, are utilized as tugs. As steaming continues only during day time—the latitude is about the same as that of London—progress is slow; down the river a speed of 12 miles, and half that speed up river, are said to be obtained. The traffic is as yet inconsiderable; the author estimates it at 30,000 tons or more annually. Down the river the rates are low, as the boats often float down empty. The general cargo up the river is charged for at the rate of about a penny per ton kilometer. To bring up goods to Stretinsk would cost something like £8 per ton. The government required a good deal of material for building the railway, which the Amoor fleet was not able to manage. Five 500 h. p. steamers have hence been ordered at Cockerill's. The Chinese trade on the river is confined to ordinary provisions; their manufactured goods go down to the gulf of Petchili and to Shanghi, and to British steamers. The article, which the authors contributed to the "Revue Scientifique, is written in French interest. The authors regret that no French consul is to be found in the immense Amoor territory; representatives of other nations may be equally scarce.

The Japanese Institution of Engineers.—When people wonder why the Japanese have made so much progress in the different departments of trade and industry, they seldom examine the conditions under which it has been carried out. They generally imagine that Japanese are very clever imitators, and that they are deficient not only in original ability but also in constructive skill. The work they have done recently proved that this opinion is not by any means correct. While they have wisely, to a very large extent, confined themselves to adopting the best European and American practice, they have shown that they are not by any means blind imitators, but are quite capable of taking into account all the conditions of the different problems which they attempt. That they have made good use of the educational opportunities at their disposal is evident, for we find that their institution of engineers now contains a total of 1,564 members. Of these 399 are full members, 1,121 associates and 11 honorary members, and 33 corresponding members. They include representatives of the different departments of engineering, and as a rule they have been well trained not only in the theory but also in the practice of their work, and the majority of them have shown that they are thoroughly trustworthy. These facts easily explain why so few foreign engineers are employed in Japan.—[Indian Engineer.

Action of Water on Cement.—The action of sea water on cement has recently received much attention. Now, A. Stutzer reports a case where river water had destroyed the concrete of a basin which had been built nine years previous. The paper in the Zeitschrift fur Angewandte Chemie simply states that it happened in a small town on the Rhine. The concrete had gradually turned into a brownish mud, which reacted alkaline; near the bottom the concrete was quite dissolved, leaving the gravel stones bare. The water was very pure but it contained carbonic acid. Analysis proved that the lime had gradually disappeared, whilst the iron and alumina had apparently increased. Portland cements, physically superior to Roman cements and hydraulic limes, are in sea water inferior to them, because the former contain a good deal of lime which wants to be saturated. The sulphates of sea water form with the Portland cements sulphate of lime at the expense of the firmness of the cement. As silicates of lime are very stable the evil can be remedied by adding trass, for instance. In fresh water part of the lime is indeed dissolved or transformed into carbonate; but this action does not threaten destruction whilst the carbonic acid does.

Shop Hints.—I think that most of the readers of Dixie, observes J. H. Allen in that paper, will readily concede that I am a believer in the use of compressed air for a wide variety of purposes. I have argued that it is reliable, efficient, convenient and economical and indeed had quite come to regard myself as a true enthusiast on the subject. Evidently, however, something is lacking, for in looking over the Shop Hints in previous issues I can find nothing that would even warrant any one in suspecting that the efficiency of the motor exceeds 100 per cent of the power of the compressor. If the consulting engineer of a compressed air company doing business in New York is to be believed, this last is a startling fact, for in a pamphlet recently issued he says: "It has been assumed that only one-half of the power expended in compressing could be recovered in the subsequent expansion of the air in doing work, and that much loss was sustained by friction in pipes where transmitted to long distances. On the contrary, it can be conclusively demonstrated that the power actually utilized in foot-pounds in the cylinder of a motor is largely in excess of the power expended in compression, and that air, under high tension, can be transmitted to very long distances with no diminution whatever in the amount of work that it is actually capable of performing. The statement of these positions generally provokes a smile of incredulity, etc." Well, I should think it would. More than 100 per cent efficiency! Shades of the perpetual motion man, have you returned to earth? But the "consulting engineer" proceeds to "demonstrate" how it is done, and I hope he succeeds to his own satisfaction and to that of his stockholders, but if you read between the lines you find he is pouring in a little extra power or heat to raise this efficiency; on the sly, as it were, and then doesn't count it in. I believe in compressed air as a useful mechanical agent, but I dislike to see a good cause damned by a bogus advocacy, and claims made for it that its best friends would never make, and all apparently for the sake of a stock-jobbing operation that depends upon such a demonstration.

Demonstration, indeed! Why almost anything can be proven to the satisfaction of some people. One may be proven equal to two, mathematically. Perhaps this will "provoke a smile of incredulity." Well, here it is. Suppose for a hypothesis that $x=1$ then $x-1=0$. Now if we multiply both sides of this equation by $(x-2)$ we will have $(x-1)(x-2)=0$. Then, as we have a perfect right to do, we will divide both sides of the last equation by $(x-1)$ which will leave us $x-2=0$, and then by transposing we have $x=2$. But by the terms of our original proposition $x=1$, hence, by substitution in the last equation, we wil have $1=2$. Why, its easy enough to prove anything if you only set about it in the right way.

The Modernizing Influence of Railroads.—According to the Mexican Herald, modern Mexico came in with the railways. The locomotive was the great missionary of new ideas; it brought with it emancipation from routine, from ancient and musty prejudices. At first the cry of the "Pacific Conquest" was raised, but it soon died out, for the intelligent and educated section of the Mexican people came to see that the dreaded Yankees were coming with capital, and were only desirous of co-operating with them in developing the resources of the country. Numberless

business alliances have been formed between Mexicans and Americans, and also with Englishmen, and the two races are getting to have a good understanding the one of the other. The railways have brought punctuality of habit, have reduced enormously the cost of interior exchange, and have cheapened the laying down of grain all over the land. A famine is no longer possible anywhere in the interior. The Mexican people are now as exigent in their demand for the best possible railway accommodations as Americans. They are as familiar with the costly and luxurious "Pullman" as formerly with the interior of the dusty and stifling *diligencia*. The furnishing of houses has undergone a revolution, especially here in the Federal District, and the change in this respect is now noted all through the larger interior towns. People need more to make them contented than in the ante-railway days; they are not so simple in their habits. There is more personal ambition, and more love of domestic comfort, and people have come to regard life less as a lottery, and dread a civil overturn. Rovolutions are unpopular. Every year will make Mexico a more delightful country in which to live. It will attract immigration, and, now that the interstate and intermunicipal taxes have been abolished, trade will be freer everywhere within the confines of the Republic, and this will lead to a higher standard of comfort. Mexico is distinctly modernizing herself.

RAILROAD POOLING.*

Hon. Martin A. Knapp, Interstate Commerce Commission.

(*Continued from page 409.*)

There are three methods of escape from the difficulties of the present situation. One is through government ownership, a scheme which has thus far made little impression upon public sentiment and exhibits no signs of popular approval. It is justly regarded as a project unsuited to the spirit of our institutions, and of such dangerous import as to be looked to for relief only when all other remedies have proved unavailing. Neither its feasibility nor its effects are at this time deserving of serious discussion. Another possible plan is universal consolidation; but this is an impracticable recourse, for such is the magnitude of the business, the diversity of interests, the multiplicity of details and the difficulty of securing needed legislation, that the task of bringing this great array of railroad companies into one corporation is quite beyond the power of present accomplishment, to say nothing of the political objections to such a vast combination of private capital.

The third alternative is to allow the various railroads, while retaining their present organization, identity and ownership, with such extension as naturally result from the growth of systems, and continuing their independent service to the communities with which they are severally identified, to contract freely and lawfully with each other for the movement of competitive traffic, without that demoralizing strife which invariably results in rate discriminations. This impiles no general consolidation of corporations no merger of financial interests, but amicable co-operation in the conveyance of passengers and property between competitive points. This is the one sensible and practicable plan, adapted to present conditions and suited in the hightest degree to existing requirements. Such a policy would permit and invite the conduct of transportation upon principles consonant with the nature of the service and beneficial to the people and the railroads alike.

If these views merit acceptance we are further advanced than might be supposed in defining the conditions upon which pooling should be legalized. It may be assumed that a measure conferring this privilege would become part of the system of law enacted by congress for the control of interstate commerce. This leads to some consideration of the scope and purpose of goverment regulation. In the nature of the case the subject of principal concern is the terms upon which the services of railway carriers may be obtained, whenever or wherever such services are required. Whether these terms are fixed by the railroads themselves, as is the usual custom, or prescribed by public authority, any regulating scheme involves a standard rate, made known by suitable publication, which constitutes, so long as it remains in force, the measure of lawful charges. This being so, two classes of questions at once arise, one relating to the means by which conformity to the standard rate may be secured, the other to the methods by which the standard itself may be altered or its reasonableness tested. It is one thing to prevent the wrong-doing effected by granting to favored persons some discount or deduction from established rates; it is quite another thing to correct injustice resulting from excessive or relatively unfair rates though properly published and impartially enforced.

This important distinction—between offenses by rate-cutting and offenses in rate-making—is frequently overlooked. For this reason doubtless there is much misconception both as to the scope of existing laws and as to the power of congress to legislate upon the subject. In many quarters it seems to be supposed that the chief duty of the Interstate Commerce Commission is to ferret out the various devices by which preferential rates are obtained, and to punish railroad officials for failing to observe their public schedules. Such a theory, however, is wholly erroneous and misleading. It must be evident upon reflection that the only effective mode of preventing those discriminations between individuals which are caused by deviating from the common rate, is to place them in the category of criminal misdemeanors. Redress by civil proceedings is manifestly inadequate.

Such offenses are not the disregard of contract obligations, they are violations of public duty. They are delinquencies to be restrained by punishment, not broken engagements to be made good by compensation. But when transgressions of this nature are made amenable to the criminal law, when the statute has impressed them with this penal character, they must be dealt with in the same manner as other punishable offenses. With reference to their prevention, or the methods whereby those who commit them may be convicted, they differ in no important respect from petit larceny or any other wrong-doing which the law declares to be criminal. In enforcing the penal provisions of the act to regulate commerce the ordinary machinery of the criminal courts must be employed, and there is no other way by which those provisions can be enforced. If immunity from these demoralizing practices is secured, it must be through greater vigilance and more vigorous effort by those who are charged with the administration of the criminal laws, and by such wholesome legislation as will take away at once the excuse and inducement for such misconduct. It is scarcely necesary to observe that the commission is wholly without authority as respects the discriminations between individuals which are made misdemeanors by that enactment. True, the commission is charged with the general duty of executing and enforcing its provisions, but it is endowed with none of the functions pertaining to the detection and punishment of delinquents, except such functions as may be exercised by any private citizen. It has no special means for discovering offenders and subjecting them to the disgrace of exposure: much less can it institute criminal proceedings, conduct trials of accused persons, or inflict penalties upon the convicted. But the main point in this connection is that congress cannot clothe the commission, or any similar tribunal, with authority to execute the penal provisions of this statute. So far as those provisions are concerned there might as well be no commission at all. To suppose otherwise is to lose sight of the more important and beneficent purpose of preventing exactions and relative injustice resulting from the strictest observance by railway carriers of tariffs which they themselves establish and apply. Regulation, therefore, implies vastly more than enforcing conformity to published schedules, and the prevention of discriminations between persons entitled to like treatment: it includes the determination of what the standard of compensation shall be, due regard being had to the rights of the public and the railroads alike. That legislation to this end is a valid and appropriate exercise of the constitutional power possessed by Congress has been affirmed by the highest judicial authority. In the recent case of Ames vs. Union Pacific Railway Company Mr. Justice Brewer uses the following language:

"Within the term 'regulation' are embraced two ideas: One is the mere control of the operation of the roads, prescribing the rules for the management hereof—matters which affect the convenience of the public in their use. Regulation, in this sense may be considered as purely public in its character, and in no manner trespassing upon the rights of the owners of railroads. But within the scope of the word 'regulation' as commonly used, is embraced the idea of fixing the compensation which the owners of railroad property shall receive for the use thereof."

Under this decision the others of similar import it may be regarded as definitely settled that, within limitations which preserve to the owners of railroad property the equal protection of the laws and prevent the taking of such property without due process of law, the power of congress—either by direct action or through the medium of a commission—to prescribe from time to time the scale of charges for the carriage of interstate commerce is in every respect complete and exclusive. Congress has not undertaken—probably will not undertake—to say by specific enactment what rates shall be charged by any road or on any article. If the tariffs in current use are filed and published as the law requires, they furnish a standard of charges prima facie lawful and binding both on the railroads and the public. So long as they are observed nobody, presumably, is injured and nobody at fault. But if complaint is made that a given rate is too high or relatively unjust, and the specific charge is denied by the carrier complained of, how is the controversy to be decided? Shall it be relegated to the courts whose methods and rules are unsuited to such an inquiry, or shall the special tribunal created by congress and exercising its power be vested with authority to determine in the first instance, and with the finality of a nisi prius court at least, the merits of the contention? The answer to this question defines the nature and aim of all regulative measures. If these are sufficient to secure needful control of the rates and conduct of railway carriers, they will provide the means for testing the justice of such rates and conduct, when they are asserted to be oppressive or unequal, and furnish the machinery for substituting the standard adjudged to be just and reasonable.

The special weakness of the law as it now stands is the want of any binding force to the decisions of the commission, though made upon facts ascertained after notice to the carriers and full opportunity for all parties to be heard. The theory of the statute is that if the directions of the commission are not complied with the courts will compel compliance unless justifying cause for not doing so is made clearly to appear. Hence it was provided that in proceedings in the courts to enforce the decisions of the commission, the facts found by it in any investigation should be deemed prima facie correct for all the purposes of such proceedings. By this I suppose it was expected that the courts would require obedience to an order of the commission, unless the record of the investigation which led to that order disclosed some error of fact or conclusion sufficient to warrant refusal to decree its enforcement. But this result has not been realized nor will this feature of the law bear such a construction. The consequence is that the disobedient carrier can have practically a new trial in the courts of the case decided by the commission. Not only so, but, the carrier may not even appear before the commission when called to account, unless compelled by subpœna to do so, and if appearing may give only such evidence as it chooses, and then if the decision is against the carrier it can meet in the courts the prima facie case found by the commission with such new evidence and defense as it is able to present.

The correction of this defect in the present law is, in my judgment, the most urgent and needful amendment in connection with legalized pooling. It is essential to efficient and useful regulation that the commission should have authority to determine in the first instance, and to the extent of a court of first instance, whether particular rates or practices, of which complaint is made and which are investigated upon notice and opportunity to be heard, are or are not in violation of the act. When such a question has been thus tried before that tribunal, its decision should stand as a rule of conduct prescribed by public authority, unless the courts upon examination of the record, should find therein some error plainly prejudicial to the defeated party. It is not proposed that the commission shall establish schedules by legistative methods or exercise the power of fixing rates by ex parte orders. Nothing of the sort is advised or desired. But it is proposed, when a given rate is complained of on the ground that it is excessive or relatively unjust, and that complaint has been examined upon due notice to the carrier and full opportunity to disclose its defense, that the judgment of the commission in such case shall be binding upon both parties to the contention, unless judicial review of the proceedings before the commission finds adequate cause for declining to decree its enforcement.

Theoretically at least, I find no occasion for specific and exceptional securities against the asserted dangers of legalized pooling. It matters not whether an existing rate is maintained by a single road or by associated roads operating under an agreement for a division of the business to which that rate is applied. In either case the question of public concern is whether that rate is reasonable, whether it is alike fair to those who pay it and those who receive it, whether it is relatively just as between different communities and different articles of traffic. The people are not interested to know how tonnage is divided or aggregate earnings apportioned, but they are vitally interested and rightfully entitled to relief, if transportation charges are excessive or unfairly adjusted. The constitutional power of congress to prevent exactions and correct inequalities is no longer open to question. If that power finds expression in wise and adequate laws, whereby charges of wrong-doing may be promptly investi-

gated, and the determinations of a tribunal to which that duty is delegated be capable of speedy enforcement, the railroads may safely be permitted to make pooling agreements, and the wisdom of such a policy will be demonstrated by its operation. What is wanted then, when current rates are challenged, is authority to adjudge with some degree of finality what rates are just and reasonable in each such case, without regard to the origin of those rates or the relations of the carriers by which they are maintained. If ample means are provided for correcting ascertained injustice in the charges of a single line, there is no reason to doubt that the same means would be equally efficient in dealing with the charges of associated lines. The questions which affect the public interest would in nowise be changed, either in their nature or mode of treatment, by the circumstance that railroads were allowed to co-operate with each other in performing their public duties. In my judgment, therefore, the amendments to the statute most needful to accomplish its general purpose constitute the principal and important conditions upon which pooling agreements should receive the sanction of law.

Inasmuch, however, as the commercial theory of transportation has not yet been wholly discarded, either by the public or by railway managers, and because legalized pooling might lead to unexpected abuses, it would doubtless be prudent to surround the privilege with some additional safeguards. Every such contract should be filed with the commission and become effective within a reasonable time thereafter—say 10 or 20 days—unless in the meantime and upon examination thereof the commission should discover in its provisions sufficient reason for official disapproval. In such event the contract should not go into effect at all except by decree of a designated court upon appeal thereto. It would also be expedient, I think, to empower the commission, after a pooling contract has been put in operation and its effects fairly observed, but upon notice to the contracting parties and an opportunity for them to be heard, to order the cancellation of such an agreement, thereby terminating its validity and remitting the carriers to the situation in which they were placed before the contract was executed. In that event the agreement should remain invalid and non-enforceable, unless and until a competent court should direct its restoration. I do not believe that occasion would ever arise for applying so drastic a remedy, yet this power of annulment might properly be held in reserve for extreme cases and peculiar emergencies. Authority to that extent appears to me so comprehensive and complete as to render superfluous all other restrictions.

So far as the whole question is concerned, including a grant of the pooling privilege and the conditions upon which it should be conferred, I am unable, after much reflection to suggest a more suitable scheme than is contained in the Patterson bill, so called, which passed the house of representatives at the last session, but unfortunately failed of consideration by the senate. Such a measure, or one framed on substantially the same lines would, I firmly believe, prove a positive advantage to the general public and inaugurate an altogether better era in railroad transportation.

Asbestos.

In itself asbestos is a physical paradox, a mineralogical vegetable, both fibrous and crystalline, elastic yet brittle, a floating stone, but as capable of being carded, spun and woven as flax, cotton or silk. It is apparently a connecting link between the vegetable and mineral kingdom, possessing some of the characteristics of both. In appearance it is light, buoyant and feathery as thistledown; yet, in its crude state it is dense and heavy as the solid rock in which it is found. Apparently as perishable as grass, it is yet older than any order of animal or vegetable life on earth. The dissolving influences of time seem to have no effect upon it. The action of unnumbered centuries, by which the hardest rocks known to geologists are worn away, has left no perceptible imprint on the asbestos found imbedded in them. While much of its bulk is of the roughest and most gritty materials known, it is really as smooth to the touch as soap or oil. Seemingly as combustible as tow, the fiercest heat cannot consume it, and no known combination of acids will destructively affect the appearance and strength of its fiber, even after days of exposure to its action. It is, in fact, practically indestructable. Its incombustible nature renders it a complete protection from flames: but beyond this most valuable quality its industrial value is greatly augmented by its non-conduction of heat and electricity, as well as by its important property of practical insolubility in acids.

As a matter of fact, Canada contains the great asbestos region of the world, in the sense that while its mines are practically unlimited in productive capacity, the product is of a quality which fully meets the requirements of the newest and most exacting of the innumerable uses that are daily being found for it.

One of the largest branches of asbestos manufacture is that of sectional cylinders for pipe coverings for retaining the heat of steam and other pipes, felt protective coverings for boilers, frost-proof protections for gas or water pipes, and cement felting, which can be laid on with a trowel, for the covering of steam pipes, boilers or stills. In some of these cases, where it is only necessary to retain the heat, the asbestos is mixed with other substances: but where the protection must be fire-proof as well, only asbestos is used. The utility of such covering is well illustrated in the heating system of railway cars. The main pipe from which the individual cars draw their respective supplies is protected by this material.

To the electrical engineer asbestos is absolutely indispensable. Many parts of electrical devices and machinery and wires through which the electric current passes become heated, and were it not for the electrical insulation and heat resisting qualities which asbestos possesses, the apparatus would be completely destroyed, particularly in the case known to electricians as "short-circuiting." For such purposes it has been found advisable to combine asbestos with rubber and other gums, and this combination is now used universally for not only electrical, but also steam and mechanical purposes.—New York Evening Post.

A NEW KALAMAZOO INSPECTION CAR.

The Kalamazoo Railroad Velocipede & Car Co., has brought out a new and improved three horse power gasoline inspection car which has a convenient capacity for four persons. Its weight complete is 1,100 lbs. and it is furnished with pilot and headlight as shown in the accompanying illustration, which gives a good idea of the neat and compact construction of the car. The wheels are 20 in. in diameter having malleable centers and steel tires mounted upon 1½ in. steel axles. The car is mounted upon spiral springs working in pedestal jaws. The motor is connected with the rear axle by means of two sets of gears controlled by a friction clutch, one set of these gears being used for running at speed and the other for starting and for climbing steep grades. The gearing is adapted to the climbing of grades of 75 ft. per mile at the rate of from 12 to 14 miles per hour and with four persons it can be run upon a level track at a speed of twenty-five miles per hour. The motor is reversible, which is frequently found to be a convenience. It is designed for long and continuous hard service, the bearings being of ample proportions and lined with anti-friction metal. The crank shafts are of forged steel. In the design attention has been given to making the motor adjustments permanent when the motor is built, which reduces to a minimum the liability of derangement. One of the special claims for the motor is the small number of parts.

NEW KALAMAZOO GASOLINE INSPECTION CAR

The motor runs in either direction by simply starting it in the desired direction. The principle of operation of the motor is as follows: The first down stroke of the piston draws a charge of air into the cylinder. At the same time the air is being drawn into cylinder a small pump is spraying a charge of gasoline into the air, near the inlet valve, (or when a fixed gas is used, the governor valve admits a charge of gas.) On the up stroke the explosive gas is compressed in the top of the cylinder. When the piston is near its uppermost position the charge is exploded by an electric igniter. The piston is then driven down by the explosion of the gases. When the piston is near the end of down stroke the exhaust valve is opened, and remains open until it is near the end of the up stroke, expeling all the exploded or burnt gases. This is repeated every second revolution, forming a succession of explosions and exhausts. The speed is controlled by an effective and simple governor. The charge of gasoline is measured for each separate explosion, and requires no adjustment either when starting, or while running. This motor is not confined to any special grade of gasoline, although the most satisfactory results are obtained with that known as 72 deg. It is not affected by change of temperature or other conditions of weather. These manufacturers furnish these cars with motors of from 2 to 16 horse power and larger cars are built with capacities of from 16 to 20 passengers. The firm should be addressed, at Kalamazoo, Mich., for further information.

FLANGELESS DRIVING WHEELS.*

The master car builders' rules for interchange of cars specify three classes of flange defects for which a car may be refused. This is strong evidence that a good flange is essential for safety. Certainly, then, there should be excellent reasons for omitting such a necessary contrivance on locomotive drivers, and the burden of proof should rather be with those that oppose the use of a flange on any driver than with those that would have all drivers flanged. Custom, however, seems to have reversed this in the case of certain classes of engines.

All eight-wheel engines now have four flanged drivers, but this has not always been the practice. A master mechanic, still in active service, tells me of an eight-wheel engine, used in 1857, having the forward drivers blank.

With engines having six drivers, three arrangements are now in use: 1. Forward drivers blank, center and rear drivers flanged. 2. Center drivers blank, forward and rear drivers flanged. 3. All drivers flanged.

With engines having more than six drivers, a still greater number of arrangements of flanged and blank drivers have been tried; but as it is an innovation having all flanged tires on engines with more than four drivers, that which follows is limited to engines having a driving wheel base of not more than 16 ft.

The present practice as to engines with six drivers is concisely stated in the letter from the Baldwin Locomotive Works, as follows: "It has been almost the universal rule in American practice, when three pairs of driving wheels are used under a locomotive, to make one pair with blank tires. In mogul engines the middle pair is made blank. In ten wheel engines the middle pair is blank, if the swing truck is used under the front of the engine; but if the truck has no swing bolster, and is only an ordinary swiveling truck, then the front driving wheels are made blank."

The advocates of blank drivers, and those of flanged drivers, will probably agree that on tangents the flanged tire is best; for it certainly is causing no extra friction, it improves the riding qualities of the engine, and, in the case of the derailment of the truck, the engine is more likely to remain on the track than if the forward drivers were blank.

If engines were always to run on tangents, the practice would probably be to use all flanged drivers, and there would be no subject for discussion.

The more curvature a road has, the more importance this question assumes, if, by using flanges on all drivers, some of the troubles from sharp flanges, uneven wear on tires and poor riding qualities of engines can be avoided.

The supposed advantages of blank drivers, as far as I have been able to learn them, are less strain on the track in passing around curves, the avoidance of flange friction on

*Abstract of a paper read by Mr. L. E. Molineux before the New York Railroad Club.

urves, as to the pair of blank drivers, and less strain on the engine generally.

Those in charge of the track on the roads now using all flanged drivers, do not find that it is any harder on the track than if one pair of drivers were blank. Track as now built will stand strains, without injury, that would have been destructive in the past.

Certainly, all flange friction is avoided on the pair of blank drivers, but the tendency of the engine to travel in a straight line (that the flanges resist) is not destroyed, but only transferred to the flanges on the other drivers, causing them to do additional work.

Most builders of engines seem to favor blank drivers, probably believing that it is easier on the engine; but this hardly seems to be the case, as the riding qualities of an engine are certainly improved by using all flanged drivers.

There is really no danger of the track being too tight on account of curvature. If an engine having a 16 ft. driving wheel base could be placed on a 20 deg. curve, with the three pairs of drivers in exact line and axles parallel, and the flanges of the forward and back drivers touching the outside rail, the flange of the center driver would be 1 5-16 in. away from the outside rail. According to the table this would figure out a clearance of ¼ in., as against a clearance of ⅜ in. on a tangent. This does not take into account any side play allowed in building an engine.

Gage of engine standing on tangent:

Distance between backs of drivers - - -	53⅜ in
Two flanges each 1⅜ in. - - - - -	2¾ in
Clearance - - - - - - - -	⅜ in
	56½ in
Standard gage 4 ft. 8½ in equals - - -	56½ in

Gage of engine standing on a 20 deg. curve, having a driving wheel base of 16 ft:

Distance between backs of drivers	53 7/16 inches.
Two flanges, each 1⅜ inches	2 3/4 "
Distance of flange of outside driver from outside rail, if drivers are parallel and in line—"Middle ordinate".	1 3/16 "
Clearance	1/4 "
	57 1/4 inches.
Standard gage, 4 feet 8½ inches	56 7/16 inches.
Widening of gage, account of 20-degree curve.	1 3/16 "
	57 1/4 inches.

Table for Widening Gage of Curves on a Road Using all Flanged Drivers up to a Driving-Wheel Base of Sixteen Feet.

Degree of Curve.	Gage.	Degree of Curve.	Gage.
1 degree	4 feet 8 7/16 inches	11 degrees	4 feet 9 inches
2 "	4 " 8 5/16 "	12 "	4 " 9 1/16 "
3 "	4 " 8 3/16 "	13 "	4 " 9 1/8 "
4 "	4 " 8 1/16 "	14 "	4 " 9 1/4 "
5 "	4 " 8 1/16 "	15 "	4 " 9 5/16 "
6 "	4 " 8 1/4 "	16 "	4 " 9 3/8 "
7 "	4 " 8 1/4 "	17 "	4 " 9 7/16 "
8 "	4 " 8 5/16 "	18 "	4 " 9 1/2 "
9 "	4 " 8 3/8 "	19 "	4 " 9 5/8 "
10 "	4 " 8 7/16 "	20 "	4 " 9 11/16 "

Note—Not adhered to strictly on lighter curves. It is hardly necessary to widen gage on curves under 6 degrees.

Another road reports an additional clearance of 3-16 in. for every 5 deg. of curvature. Makers of locomotives, in their printed descriptions, rarely give any information as to flanged or blank tires; but it is of interest to note that, instead of using the term "rigid wheel base," they say "driving wheel base," thereby showing that drivers are not expected to be in line and axles parallel in passing around curves. One road represented here to-night mounts the tires on its consolidated engines as follows: Front tires, 53⅛ in.; main tires, 53¼ in.; (⅛ in. wider); third pair, 53⅜ in. (⅛ in. wider); back pair, 53⅜ in. They give side motion between inside hub and box, on new work ⅛ in. clearance, and have no trouble from sharp flanges. These engines pass nicely around a 23 deg. curve in main line at a slow point, and around a 14 deg. curve in main line, which is not a slow point.

Some of the advantages of having all the drivers flanged are.

1. Fewer derailments: A blank driver can go in any direction without being lifted; whereas, one of a pair of flanged drivers, to leave the rail, except in cases of track spreading, must be lifted a hight equal to the depth of the flange, and this tendency is opposed by at least half of the weight on the pair of drivers in question; consequently, the force to derail a pair of flanged drivers, in the first place, must be much greater than to derail a pair of blank drivers. It practice it has been found that fewer derailments occur with all flanged drivers.

As a natural consequence of this, the engineman feeling more confidence in his engine will, where high speeds are required, be far more likely to make his time than with blank drivers. Recently, in speaking to a former engineman noted for fast running, who now holds the position of road foreman of engines, this point was strongly brought out, and he said that enginemen now making fast time in express service with ten wheel engines, all drivers flanged, would feel, if placed on engines having one pair of blank drivers, such a lack of security that trains behind time would be the result.

2. In a wreck much easier to place on the rails, and take to the shop in a crippled condition.

Two examples will illustrate: A six wheel switch engine, all flanged drivers, was pushing a freight train on a main line, when one of its rear drivers dropped off, due to defective axle. The rear axle was blocked up, and engine went to shop under her own steam. Had the center drivers been blank, this could not have been done.

A ten wheel engine with forward drivers blank was wrecked, head end and truck being destroyed. Crew started to take engine backward to the shop without a truck, and all went well until, on account of bridge repairs, the engine had to be run forward over a cross-over. Without truck, engine would not curve the cross over. The blank drivers would drop off the rail every time an attempt was make. Pull the engine back, and the blank drivers would mount the rail readily. After repeated trials a truck was secured, and engine made the cross ever easily; but this caused a delay of several hours.

3. A flanged tire is stronger than a blank one, and, being less liable to break, can be run longer: With one pair of blank tires and two pairs of flanged tires on an engine, when the blank tires are worn down to the safety limit, the four flanged ones have not yet reached the limit of safety, and this additional mileage of the flanged tires is not available as it would be if all tires were flanged.

4. More mileage on account of fewer sharp flanges: With all flanged drivers, the wear will be more nearly equal on all, and the full mileage of the tire is available. With center drivers blank, the forward drivers are liable to have sharp flanges, necessitating the turning down of all the drivers, to procure a safe flange for forward drivers. One of the most crooked roads in the country reports having much trouble with sharp flanges on forward drivers, when its mogul engines had the center drivers blank, and its consolidated engines had the two center pairs of drivers blank. They frequently turned down a entire set of wheels from ½ to ⅝ of an inch in thickness, to procure safe forward flanges. All trouble from sharp flanges gradually disappeared when they commenced leaving flanges on blank drivers, as engines came into the shop for tire turning. They now have full flanges on drivers originally blank, obtained from successive turnings, and report excellent results.

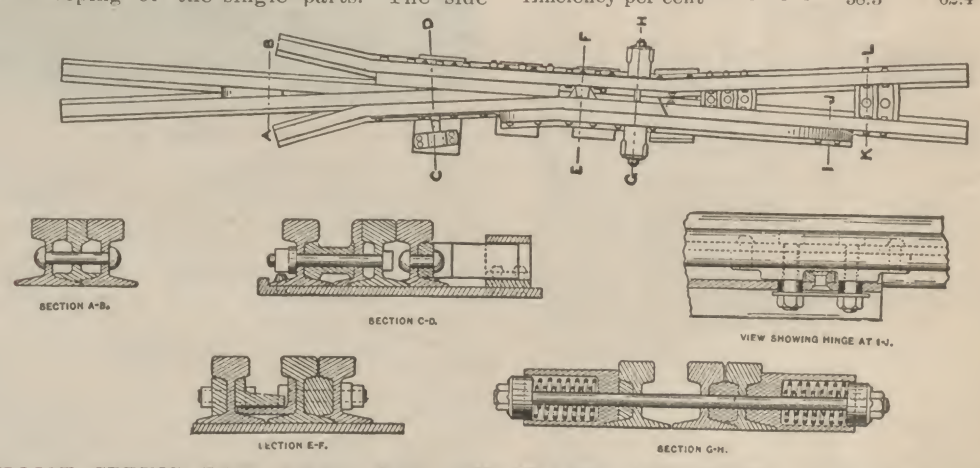
5. First cost less: Engine tires are sold by the pound, the price being the same for flanged or blank ones. As blank tires are usually ordered from an inch to an inch and a half wider than flanged tires, they weigh more, and consequently cost more.

6. Smaller stock of duplicate parts: A road using all flanged tires will have to keep but one kind of tires on hand, and only one style of driver brake shoe will be necessary.

7. More tractive power: All tires wear hollow on that portion of the thread which travels on the head of a rail on a tangent. This hollow increases until 11-32 in. deep, when tires are turned. Now, if one of the advantages of blank drivers (easier on curves) is experienced in practice, this hollow will be partly shifted to one side of the head of the rail in passing over curves; and the blank drivers will rest on one of these ridges on either side of the hollow, in which position it does not have a full bearing on head of rail, and is much more liable to slip than if it had a full bearing, causing loss of power at the very time when additional power is needed. With flanged tires the wheel is kept in position so that each driver, has a full bearing on the head of rail, and the weight of the engine is more equally divided between the rails.

THE NEW EUREKA SPRING RAIL FROG.

A new spring rail frog has recently been placed upon the market by the Elliot Frog & Switch Company of East St. Louis, Illinois, which is an improvement upon the old pattern of the Eureka frog which is a well known product from the works of this company. The essential features of difference between the new and the old design are indicated in the accompanying illustration. The difference in the designs is that the new construction makes use of tie plates and of steel anchor blocks between the main and side track rails thus framing the two rails securely together. The point of the frog is bolted solidly to the side track rail as shown in the section on line C, D. This prevents any displacement or creeping of the single parts. The side track rail is reinforced by a wrought iron strap extending from the point of the frog to the anchor block. This tie plate construction is preferred by many on account of the freedom in tamping which gives it a considerable advantage over the frogs which are like the earlier Eureka pattern, riveted to base plates. It will be remembered that the special features of the Eureka pattern are the shortness of the amount of main track rail which is movable and the reinforcement of the movable rail by the attachment of a stiffening piece alongside of it, whereby the pieces of this rail would be held in position if the rail should break. The application of these reinforcements upon both sides of the new frog may be seen in the illustration.



ELLIOT SPRING RAIL FROG, WITH TIE PLATES AND STEEL ANCHOR BLOCKS.

BOILER ROOM ECONOMIES.*

T. W. Yardley.

During the past four years we have found a great saving can be made in the fuel bills of many pumping stations and power plants. In fact, it is seldom that a station is a model in every respect.

When most boiler plants are planned and built the particular kind of coal to be used is not considered. Then the best coal for that particular furnace or seting is found, but it seldom happens that this will give the cheapest steam. When eastern energy and capital came west of the Allegheny Mountains it brought with it a relic of the past called "the plain grate," which is all right in its place, but it has absolutely no place except where anthracite coal is used. It is simply throwing money away to try to burn coal containing 35 per cent volatile matter on a grate which is adapted to a coal having only 10 per cent, and hence not requiring nearly so much air to complete combustion. In most localities there is some particular coal which can be obtained at less cost per ton than any other, but this coal is rarely used, as the engineers will say it is not adapted to their plan.

An average of some 40 samples of Illinois coal recently examined in our laboratory gives the following approximate compound:—Fixed carbon, 41.52 per cent, volatile matter, 41.33 per cent.; ash, 12.94 per cent.; moisture 4.21 per cent. The carbon yields about 14,500 heat units, while the volatile matter gives 20,500 heat units per pound. When this highly volatile coal is thrown into a hot furnace suddenly, the gases are immediately distilled and pass off without combining with sufficient fresh air to complete combustion. When they strike the comparatively cold boiler tubes a heavy black smoke is produced. Could this coal have been fed into the furnace slowly and continuously, thus allowing the gases to pass off slowly as the coal is coked, a much higher temperature in the furnace, a clear stack and a great increase in the efficiency of the boiler and furnace would be obtained.

To substantiate this assertion, I give a summary of a series of trials made to determine what furnace was the best adapted to the economical burning of a highly volatile coal from Ohio. The coal in the different trials was from different localities of the same vein. The boiler was a first-class make of water tube style, and the setting alone was varied. The tests were each of ten hours' duration and made under ordinary running conditions.

No. 1. Arch furnace and plain grates.
No. 2. Arch furnace and shaking grates.
No. 3. Arch furnace and rolling grates.
No. 4. Down draft furnace. Capacity test.
No. 5. Down draft furnace. Economy test.

	No. 1.	No. 2.	No. 3.
Heating surface - - - - -	2,580	2,580	2,580
Grate surface - - - - -	42	42	49
Escaping gases - - - - -	644°	530°	669°
Evaporation per pound coal from and at 212 deg. - - -	7.34	7.92	7.87
Efficiency per cent - - - -	58.3	62.4	61.9

	No. 4.	No. 5.
Heating surface - - - - - - - -	2,580	2,580
Grate surface - - - - - - - - -	35.5	35.5
Escaping gases - - - - - - - -	483°	431°
Evaporation per pound coal from and at 212 deg. - - - - - - - - -	8.79	9.10
Efficiency per cent - - - - - -	69.4	71.9

The efficiency in each case was calculated from the total British thermal units and the heat absorbed by the water.

The analysis of the coal was: Moisture, 1.00; vola-

*Abstract of a paper read before The American Water Works Association.

tile matter, 39.54; fixed carbon, 47.00; ash, 12.46; British thermal units (by calorimeter), 12,100. A down-draft furnace was chosen for this coal because of the possibility of admitting any required amount of hot, fresh air.

Speaking of smokeless furnaces and mechanical stokers, I do not doubt that each one of you has been bothered with representatives claiming and guaranteeing increased economy and capacity over every other make, but it is as preposterous for them to claim superior results with the same furnace on all grades and kinds of coal as it is for us to try and burn soft coal economically on the plain grate.

There are few of the many patent furnaces which have not some good points, and each one has been developed for some certain grade of coal, but we have not yet yet found one whose owner has studied the subject sufficiently to know just what coal his furnace can burn most economically and tell the reason why.

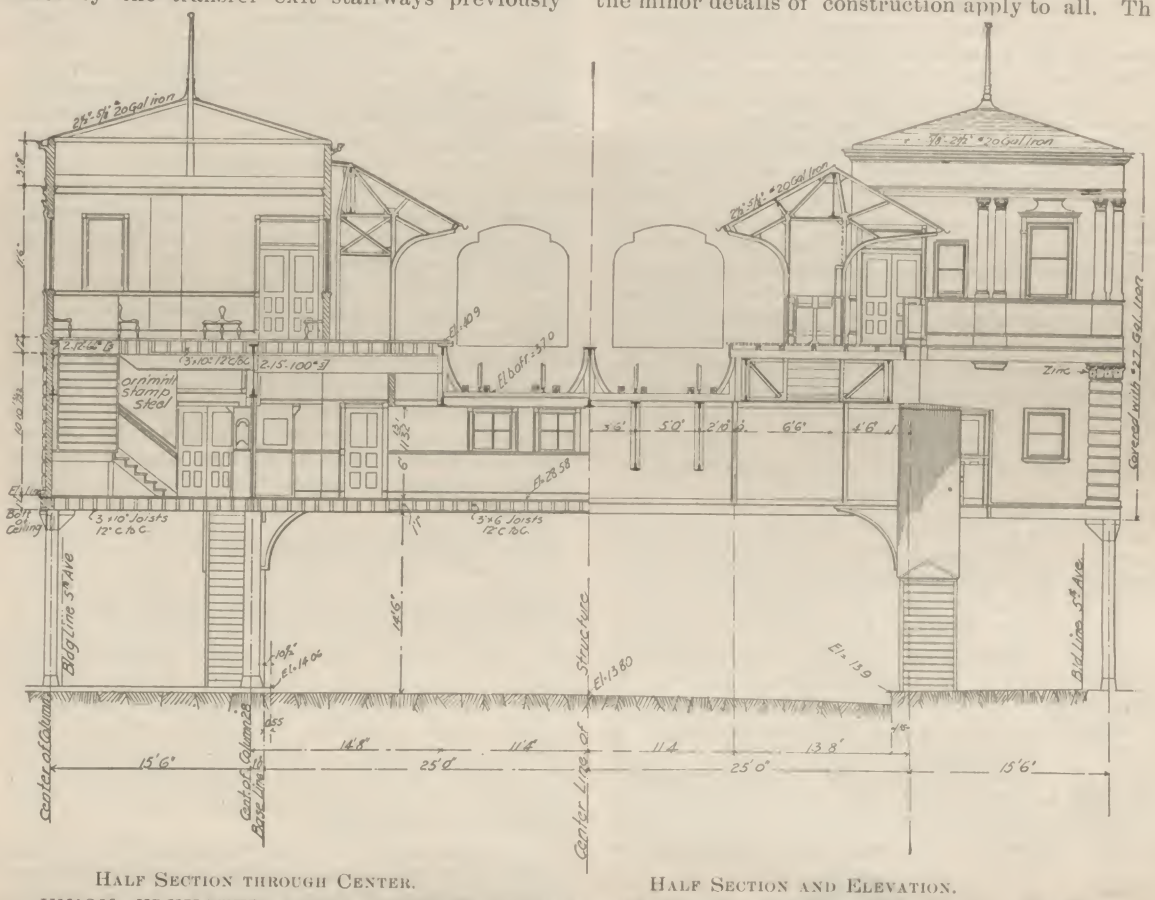
Two large boiler companies have recently carried on long series of tests on different western coals, with plain grates, and it is only a question of time when both boiler and furnace companies will know just what different results will be obtained with different combinations and with different coals. A large western water works plant recently let a contract for the construction of boilers and furnaces under a certain guaranteed efficiency, using Pocahontas coal for the tests. The furnace and setting will be constructed to obtain the best results from this high grade, high priced coal, but it is a question whether the same settings will give the same results with a cheaper coal which can be obtained at that point, and from which steam can be generated for at least 15 per cent less money. Had the situation been carefully studied and the best coal decided upon, and test made on that coal, the possibility of mistakes would have been avoided, for the best furnace for one may not be the best for another coal.

STATIONS OF THE UNION ELEVATED LOOP, CHICAGO.

The Union Elevated Loop of Chicago, which is to furnish the down town connections and permit of transfers between the four elevated railways running into the city, is to have eight stations upon the structure. The designs for these stations have been made as nearly uniform as the varying conditions due to location would permit. The one at Madison street and Fifth avenue has been taken as a typical design as it embodies the important features of all, and a discription of it will give a good idea of the others. The difference between the stations is mainly in the dimensions of the houses and platforms and not in detail or finish. This work is being carried on by Mr. J. A. L. Waddell consulting engineer and Charles V. Western, chief engineer of the road who has personal charge of the work. We are indebted to the latter gentlemen for the drawing and information which enables us to present this description.

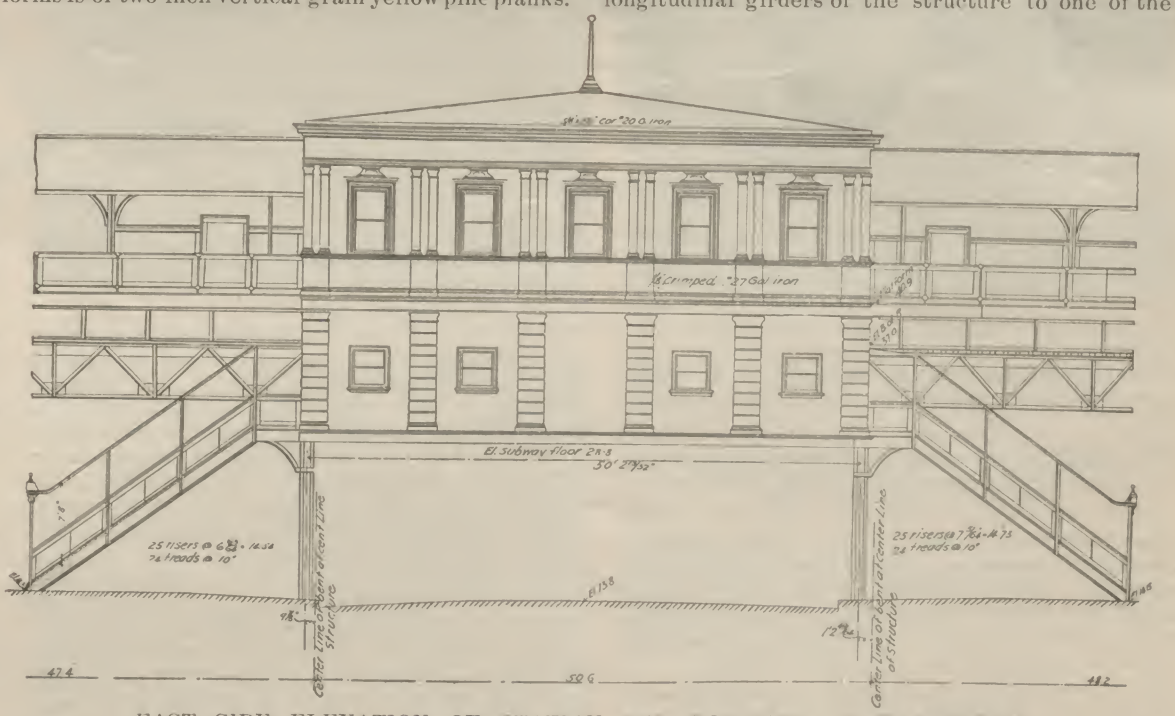
The illustrations show an east elevation of the station referred to with the platforms and their cover ings cut away at the ends and also sectional views are given transversely with the track. The total length of this station including platforms is about 250 ft. It consists of two separate main platforms and houses which are connected by a subway under the structure for transfer purposes. For the accommodation of this subway the structure is modified at the crossings of the streets at which the stations are located, for the purpose of extending the subway across from one house to the other without either interfering with the street or necessitating an unduly high structure. A minimum clearance of 14 ft. is required above the streets and as the subway is nearly 7 ft. deep the tracks are carried by plate girders along the bottom chords of which the track floor is laid instead of upon the top chords of lattice girders as in the other portions of the structure. The houses referred to are 22 x 51 ft. and consist of two stories each. The lower or subway floor is approached by two stairways leading to the vestibules from the side walks on Fifth avenue. The platforms are centrally located and the ticket offices are so arranged that they must be passed by all passengers before they can gain admittance to the upper story. Special exit stairways for transfer passengers lead down from points on each side of the middle of the platform to points just back of the ticket offices and near the entrances to the cross over corriders. At the upper end of each of these stairways a turnstile will be placed. Seats are placed along the walls for passengers and toilet rooms for employes and janitors closets are located on the lower floor of each house. The upper stories contain the waiting rooms, vestibules, and toilet rooms for men and women. Seats are provided along the walls and at the center of the rooms for the accommodation of passengers.

A fence or screen divides each platform into two nearly equal portions, in the exterior space passengers will wait for trains and the interior and larger space forms a landing for passengers coming from trains. These passengers can either descend to the street by exit stairways closed by sliding gates at the ends of the platforms or they can pass down into the houses by the transfer exit stairways previously mentioned. The sides of the houses consist of wooden studding, sheathed on both sides and covered on the outside with ornamental galvanized iron work and on the inside with oak, wainstudding and ornamentd stamped steel. The floors of the houses and those of the platforms are built of wooden joists, fastened to the metal work of the structure by bolts and hook nails. The flooring of the houses is of common pine with an oak floor finish on top, while that of the plat forms is of two inch vertical grain yellow pine planks.



HALF SECTION THROUGH CENTER. HALF SECTION AND ELEVATION.

UNION ELEVATED LOOP STATION CHICAGO, MADISON STREET AND FIFTH AVENUE.



EAST SIDE ELEVATION OF STATION AND PORTIONS OF PLATFORMS.

The roofs of the houses and of the canopies which cover the platforms and stairs are to be covered with corrugated galvanized iron. Those of the houses are to be supported by timber trusses and beams as shown in the illustrations. The floor and sides of the subway corridor are to be similar to those of the houses, but the roof will consist of the buckled plate floor of the railway.

The houses, stairs, platforms and subways are to be lighted by both electricity and gas, the latter being provided for emergencies only. For each station about 136 incandescent lamps of 16 candlepower each will be required. Thirty-six of these will be upon the platforms, 24 on the stairways, 48 in the waiting-room, 8 in the ticket offices, 8 in the closets, the same number in the vestibules and 4 in each of the subways. The houses will be heated by hot water. The stations are to be located as follows: At the corners of Madison street, Lake, and Quincy streets and Fifth avenue; and at the corners of Randolph, Washington, Madison, Congress and Adams streets and Wabash avenue. The specifications for the minor details of construction apply to all. The canopy roofs over the stairways and platforms as well as the roofs of the houses are covered with ⅞ x 2½ in. corrugated No. 20 galvanized iron. All the conductors are 4 in. in diameter and of No. 27 corrugated galvanized iron. The gutters drain toward the conductors which are located at the canopy posts over each bent. There are two curved conductors at each canopy post at each bent to conduct the water from both gutters of the canopy roof down underneath the longitudinal girders of the structure to one of the main columns, thence down to the column and in extra heavy cast-iron pipes, extending five feet above the street level.

The exterior portions of the houses and subways are covered with No. 27 galvanized iron, all plain surfaces being crimped ⅛ in. The pilasters, caps, wreaths, consoles and modillion leaves are made in artistic manner of stamped zinc. Specifications with regard to construction of the platforms provide for the fastening of the platform beams to the steel girders from below by hook nails. The longitudinal

girders are then to be put in place and the vertical grain flooring be spiked on top with quarter inch spikes, leaving quarter inch openings between the planks. The platforms are crowned one inch by means of beveled beams furnished by the railroad company. Close to the station houses the platforms are level. The stairs leading from the subway floors to the upper floors of the houses are of 1¾ in. oak stringers with molded tops and 1¾ in. oak treads, the risers being of 1¼ in. oak plowed into the treads at top and bottom. The exit, entrance and transfer stairways are to be built of steel, and were put in place by the railway company. All the hardware trimmings for doors and windows, as well as the railings for the subway stairs and the grills for the ticket office windows, are of the Bower-Barff finish. The plumbing is to be specially complete.

The work of construction of these stations is being pushed rapidly and several of them are now nearing completion. The design has been decided upon after careful consideration of convenience and with special reference to the rapid handling of passengers, and at the same time the details have been arranged in an artistic manner, which relieves the buildings of the plainness which is common to such structures. A sufficient number of the general dimensions are given in the sectional view to give a good idea of the proportions of the platforms and parts of the buildings.

A HOSE STRAINER FOR INJECTORS.

A new form of hose strainer for the suction pipes of locomotive injectors has been patented and introduced by the Hancock Inspirator Company, and is shown in the accompanying illustrations. Fig. 1 gives an exterior view and Fig. 2 a section, through the casing. This device consists of a perforated copper plate held in a metal frame which fits into slides in the body of the strainer casing. By removing the tapered key seen in Fig. 1, the bonnet covering the casing may be easily removed when it is desired to take out the strainer for cleaning. The bonnet is fitted with a ground joint, the seat of which is protected from damage by its location. The strainer is given such an angle that coal or other sediment from

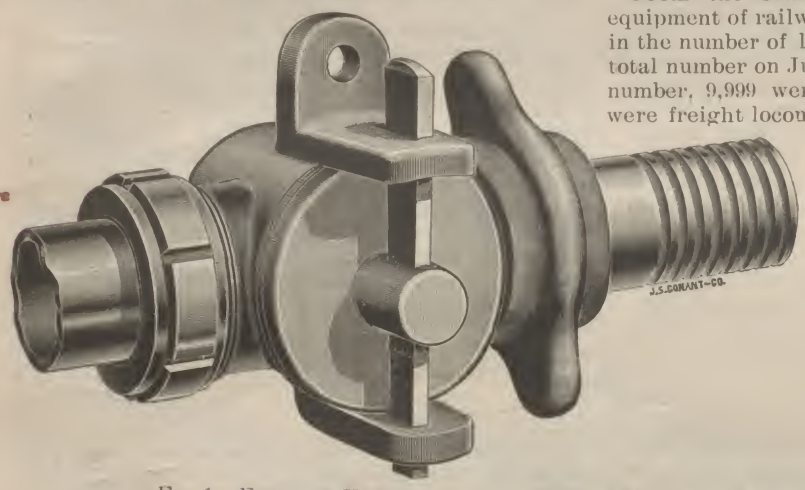


Fig. 1.—Exterior View

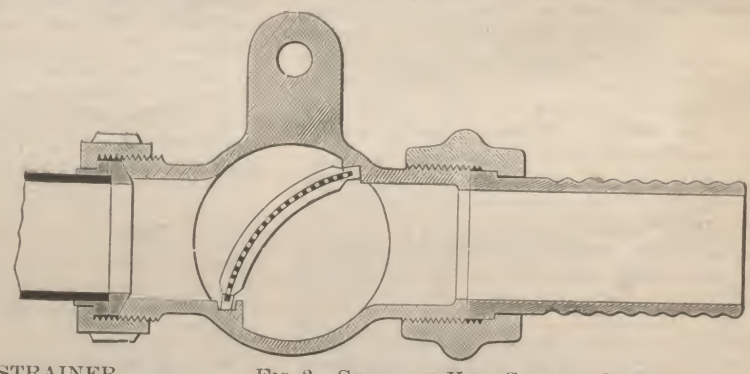


Fig. 2.—Sectional View Showing Strainer.

THE HANCOCK PATENT HOSE STRAINER.

the tank will drop below the plate and not interfere with the waterway. The strainers are made right and left, and one end of each is fitted for the size of hose coupling to be used while the other end is made to fit standard sizes of iron and copper pipe. The simplicity of the construction and the convenience with which the strainer may be taken out for cleaning are the chief recommendations of this improvement.

STATISTICS OF THE RAILWAYS OF THE UNITED STATES FOR THE YEAR ENDING JUNE 30, 1895.

The Eighth Statistical Report of the Interstate Commerce Commission, prepared by its statistician, being the complete report for the above named period, for which a preliminary income account was issued in December, 1895, has just been submitted, of which the following is an abstract.

In the introduction of the report the statistician calls attention to three special features: First, the showing of comparative figures where possible for the five previous years: second, the compilation of operating expenses for two years, one summary being based on the revised classification of operating expenses, taking effect July 1, 1894, the other on the classification followed from 1887 to that date; and third, the compilation of a table showing revenue and density of traffic for roads whose gross revenue exceeds $3,000,000. Reference is made to the effect of the continued business depression and the large number of receiverships. On June 30, 1895, 169 roads were reported in the hands of receivers, showing a net decrease of 23 during the year. The roads under receivers operated 37,855.80 miles of line, which shows a decrease of 2,963.01 as compared with 1894. The railway capital represented by these roads was nearly $2,500,000,000, or about 22.20 per cent of the total railway capital in the United States.

The total railway mileage in the United States on June 30, 1895, was 180,657.47 miles, an increase of 1,948.92 miles, or 1.09 per cent being shown. The increase in 1894 was 2,247.48 miles, or 1.27 per cent, which was less than for any preceding year during the period for which reports have been made to the commission. The territory and states in which the increase in mileage exceeds 100 miles are Arizona, 247.41 miles: Illinois, 188.70 miles: Pennsylvania, 157.00 miles: Maine, 132.86 miles; Texas, 110.41 miles: and Montana, 105.79 miles. The aggregate length of all tracks in the United States on June 30, 1895, was 236,894.26 miles. Included in this total track mileage were 10,639.96 miles of second track, 975.25 miles of third track, 733.12 miles of fourth track, and 43,888.46 miles of yard track and sidings.

The number of railway corporations on June 30, 1895, was 1,965, of which 1,013 maintained operating accounts, and 800 financial accounts. During the year 14 roads were abandoned 9 merged, 32 reorganized, and 28 consolidated. The classification of railways on the basis of operated mileage shows that 42 companies each operating more than 1,000 miles; operate 100,714.71 miles of line, or 55.67 per cent of the total railway mileage: 24 roads with an operated mileage ranging from 600 to 1,000 miles, operate 18,896.40 miles, or 10.45 per cent: 22 roads with an operated mileage ranging from 400 to 600 miles operate 11,177.07 miles, or 6.18 per cent; 45 roads with an operated mileage ranging from 250 to 400 miles operate 14,366.95 miles, or 7.94 per cent: and 971 roads with an operated mileage under 250 miles operate 35,770.53 miles, or 19.77 per cent. It thus appears that 133 roads, or 12.05 per cent of operating companies operate 145,155.13 miles, or 80.24 per cent of total mileage in operation. From an inspection of the comparative summary from which these figures are obtained, however, no very great changes in classification are noticeable.

From the summaries given pertaining to the equipment of railways, it appears that the increase in the number of locomotives in service was 207, the total number on June 30, 1895, being 35,699. Of this number, 9,999 were passenger locomotives, 20,012 were freight locomotives, 5,100 were switching locomotives, and 588 were unclassified. The number of cars of all classes reported, being those owned by railways, was 1,270,561, which indicates a decrease of 7,517 as compared with the previous year. Of the total cars reported, 33,112 were in passenger service, 1,196,119 were in freight service, and the remainder, 41,330, were cars used by the reporting companies in their own service. There was an increase of 94 in the number of passenger cars, and an increase of 1,439 in cars assigned to company's service, but cars in freight service decreased 9,050. The explanation of this decrease is not wholly to be found in an effort on the part of the railway companies to economize in equipment, but rather in the increased use made of private cars. From the summaries given it appears that there was a decreased efficiency in passenger service, and an increased efficiency in freight service during the year covered by the report. The number of passengers carried per passenger locomotive was 50,747, or 3,907 less than in 1894. The number of passenger miles per passenger locomotive was 1,218,967, or 225,433 less than in 1894, while the number of passenger cars per 1,000,000 passengers carried was 65, or 12 greater than the preceding year. This is probably largely due to decreased travel on account of business depression, but it also suggests that passenger traffic has returned to its normal condition previous to the World's Columbian Exposition. The number of tons of freight carried per freight locomotive in 1895 was 34,817, showing an increase of 2,908 when compared with the corresponding figures for 1894. The number of ton miles per freight locomotive was 4,258,821, the increase over the previous year being 242,066. These figures indicate increased economy in transportation of freight. The same result is shown by the fact that 1,888 freight cars were required to move 1,000,000 tons of freight in 1894, and 1,717 in 1895. These figures, however, are not satisfactory because the basis of the computation does not include cars not owned by railway companies, in which a large proportion of freight is transported.

Out of a total equipment of 1,306,260 locomotives and cars, only 362,498 were fitted with train brakes, and 408,856 with automatic couplers on June 30, 1895. The increase in equipment fitted with train brakes was 31,506, with automatic couplers, 51,235. The summaries presented show that almost all passenger locomotives are fitted with train brakes, and 16,712, out of 20,012 freight locomotives have them. The number of passenger locomotives fitted with automatic couplers on June 30, 1895, was 3,893, the increase during the year being 414. It appears that 6,106 passenger locomotives were without automatic couplers. The number of freight locomotives fitted with automatic couplers was 2,039, the increase during the year being 731, but as there were 20,012 locomotives in freight service the deficiency in respect to automatic couplers is marked. On June 30, 1895, the number of passenger cars in service was 33,112, of which 32,384 were fitted with train brakes, and 31,971 with automatic couplers. The number of freight cars in service was 1,196,119, of which 295,073 were fitted with train brakes, and 366,985 with automatic couplers. It appears that the passenger service is well equipped with automatic safety appliances, but that the freight service is greatly deficient in this respect.

The number of men employed by railways shows an increase of 5,426, as compared with last year, the number of employes being 785,034 on June 30, 1895. It appears there was an increase in employes in group I, group II, group III, group V, and group IX, but a decrease in the other five groups. Group V shows the largest per cent of increase. In last year's report it was mentioned that the effect of commercial depression upon the pay roll of railways fell most severely upon maintenance of way and structures, and next to this upon maintenance of equipment. The comparative figures presented in the report also show that such is the case. The returns for the present year show that 128 men were assigned to maintenance of way and structures per 100 miles of line, against 123 in 1894. The number of men correspondingly assigned to maintenance of equipment also shows a slight increase, being 88 for 1895, and 86 for 1894.

The amount of railway capital on June 30, 1895, is shown to be $10,985,203,125, or $63,330 per mile of line. The increase during the year was $188,729,312. Railway capital was distributed as follows: The amount of capital stock was $4,961,258,656, of which $4,201,697,351 was common stock, and $759,561,305 preferred stock; the funded debt was $5,407,114,313, classified as bonds, $4,659,873,548, miscellaneous obligations, $445,221,472, income bonds, $246,103,966, and equipment trust obligations $55,915,327: the current liabilities amounted to $616,830,156. Of the capital stock outstanding, $1,169,071,178, or 23.57 per cent was owned by the railway corporations, as well as $437,508,841, or 9.39 per cent of bonds outstanding. These figures show an increase in the corporate ownership of securities, probably rather due to railway consolidation than to the strengthening of reserve funds.

Stock to the amount of $3,475,640,203, or 70.05 per cent of the total outstanding paid no dividend, and $904,436,200, or 16.90 per cent of funded debt, exclusive of equipment trust obligations, paid no interest during the year covered by the report. In no other year since the organization of the division of statistics has so large a percentage of stock passed its dividends, or, except in 1894, has so large a percentage of funded debt defaulted its interest. Of the stock paying dividends, 6.89 per cent of the total stock outstanding paid from 4 to 5 per cent; 5.39 per cent of this stock paid from 5 to 6 per cent; 4.41 per cent

paid from 6 to 7 per cent, and 3.99 per cent paid from 7 to 8 per cent. The total amount of dividends was $85,287,534 which would be produced by an average rate of 5.74 pr. ct. on the amount of stock on which some dividend was declared. The amount of bonds paying no interest was $624,702,293, or 13.41 per cent; miscellaneous obligations, $54,498.288, or 12.24 per cent; of income bonds, $225,235,619, or 91.52 per cent.

The number of passengers carried by the railways during the year ending June 30, 1895, was 507,421,362, which shows a decrease of 33,266,837. The number of passengers reported as carried one mile was 12,188,446.271, a decrease of 2,100,999,622 being shown when compared with figures for previous year. The number of tons of freight carried as reported by railways was 696,761,171, which gives an increase of 58,574,618 for the year. The number of tons carried one mile was returned as 85,227,515,891, indicating an increase of 4,892.411,189.

The gross earnings of the railways of the United States for the year ending June 30, 1895, were $1,075,371,462, an increase of $2,009,665 for the year being thus shown. Passenger revenue was $252,246,180, showing a decrease of $33,103,378, or 11.60 per cent for the year. Freight revenue increased $30,502,549, or 4.36 per cent, being $729,993,462 for 1895.

The expenses of operation for the same period were $725,720,415, which were $5,693,907 less than for 1894. The important unit in railway statistics designated as the coefficient of operating expenses, that is the percentage of operating expenses to operating income, for 1895, was 67.48 per cent; for 1890, 65.80 per cent. The income from operation, $349,651,047, though $7,703,572 greater than it was in 1894, was yet less than for any other year since 1890. The income accruing to railways from investments and sources other than operation, amounted to $132,432,133. These figures, compared with corresponding ones for the previous year, show a decrease of $10,384,672. The amount of money at the disposal of railways for fixed charges and dividends is the aggregate ofincome from operation and income from other sources. This amount for 1895 was $482,083,180. Fixed charges for the year amounted to $425,966,921. In the year 1894 they were $3,041,389 greater. The deduction of fixed charges leaves $56,116,259 as net income from which to pay dividends. The amount of dividends, including $673,957 other payments from net income, was $85,961,500, from which it appears that the railways of the United States closed the year with a deficit from the year's operations of $29,845,241, which was met by a decrease in accumulated surplus, or by the creation of current liabilities. The corresponding deficit for the year ending June 30, 1894, was $45,851,294.

In connection with an explanatory statement, two summaries appear in the report, which give an analysis of operating expenses for the years ending June 30, 1894 and 1895. The summary for the former year embraces 50 items, and the summary for the latter year, conforming to the revised classification, 57 items.

From a compilation showing revenue and density of traffic for roads whose gross revenue exceeded $3,000,000, it appears that the 75 companies represented for 1895, operated a mileage of 119,8100.8 miles, or 67.41 per cent of the total mileage operated. The gross earnings of these companies were $874,542,695, that is, 81.32 per cent of the gross earnings of all the railways of the United States. The average gross revenue per mile of line for the same companies was $7,299, while for all the railways it was $6,050. The figures also show that these 75 companies performed 84.08 per cent of the total passenger service, and 84.55 per cent of the total freight service. It is interesting to note that the net revenue per mile for this class of roads as a whole, which was $2,862 in 1890, decreased to $2,425 in 1895, the difference being $437. There appears to have been an increase in net revenue per mile of line only in group I, composed of the New England states, group VI, covering the territory west of Lake Michigan and Indiana, and east and north of the Missouri river, and group IX, including the states of Louisiana and Texas.

The number of railway employes killed during the year ending June 30, 1895, was 1,811, and the number injured was 25,696. These figures compared with those of the previous year show a decrease of 12 in number killed, and an increase of 2,274 in the number injured. The number of passengers killed was 170, the number injured, 2,375. These figures give for the year a decrease of 154 in the number killed and 659 in the number injured. The number of passengers killed is remarkably small. The smallest number killed in any of the preceding seven years was 286 in 1890. One employe was killed for each 433 employed, and one employe was injured for each 31 employed. Of the class of employes known as trainmen, that is, engineers, firemen, conductors and other employes whose service is upon trains, it appears that one was killed for each 155 in service, and one injured for each 11 in service. The number of passengers carried for each passenger killed during the year was 2,984,832, and the number carried for each passenger injured was 213,651. The liability of passengers to accidents is better shown in the fact that 71,696,743 passenger miles were accomplished for every passenger killed, and 5,131,977 passenger miles for every passenger injured. A comparative statement shows that considerable advance was made during 1895 in respect to railway casualties. It is suggested that beneficial results were derived from the fitting of equipment with automatic appliances as well as from the raising of the character of railway service and grade of railway equipment, first noted in the last report.

In concluding his report the statistician renews his recommendations that reports be required from express companies engaged in interstate traffic, from all corporations, companies or persons owning rolling stock which is used in interstate commerce, as also all corporations, companies, or persons owning depot property, stock yards, elevators and the like, and from all carriers by water whose business influence interstate traffic. The further recommendation is made that congress be requested to provide for a bureau of statistics and accounts, which shall have the right of inspection and control over the accounting departments of the common carriers.

THE HAUSS MAIL CRANE AND CATCHER.

A new design of receiving and delivering mail crane and catcher has been developed and introduced by the Hauss Iron Mail Crane Co. of New Albany, Indiana. This device possesses a number of interesting features and from the manner in which it has been received, there seems to be no doubt of its coming into extensive use. The construction is entirely of iron and consists of a main column of cast iron, which is hollow and provided at its upper end with sockets for receiving two malleable iron arms to which the apparatus designed for the holding of the mail pouch for delivery to the train and also for the catching of the pouch from the train in motion

FIG. 1.—BEFORE EXCHANGE OF POUCHES.

FIG. 2.—AFTER EXCHANGE OF POUCHES.

are attached. The two operations are performed by the same apparatus and without the danger of the pouch delivered from the train being drawn under the wheels or thrown along the platform where it may strike persons who happen to be in its path. The upper arm is hinged at the top of the post in such a position that it may swing in a vertical plane and revolve up out of the way when relieved of the weight of the pouch. A counterweight effects this movement and the outer end of the arm striking upon a spring prevents shock to the apparatus.

The manner in which the pouch to be delivered is supported as seen in Fig. 1. It is furnished with a ring at each end, the upper ring being hung upon a finger projecting from the top arm and pivoted in its connection with the arm, so that it may swing as the pouch is caught by the car catcher, whereupon the ring will easily slip off the finger. The lower end of the pouch is secured by a similar finger upon the lower arm, which is raised for the reception of the pouch. These fingers are provided with spiral springs at their attachment to the arms, and the upper arm is cushioned in its horizontal position by a two-leaf steel spring which rests upon the top of a column and lets the arm spring downward as the pouch is removed by the catcher, allowing it to be detached without danger of tearing off the rings Fig. 2 shows the position of the arms after the transfer of pouches.

The lower arm of the crane is also provided with a motion in a vertical plane, and is so arranged that the end toward the train will drop clear of the train after the transfer has been made. This arm is supplied with two catchers, one for each direction, which will take the pouch from a moving train and hold it securely until removed from the crane by hand. This catcher on the crane is provided with two wings, one of which is stationary with reference to the arm of the crane, and the other is hinged at the arm and is urged toward the stationary wing by a spring, the office of the movable wing being to open and admit the constricted portion of the pouch and then to close again and hold it fast. The form of the apparatus on the mail car is such that the operation of catching the pouch from the crane and delivering one to the train is performed simultaneously, the catching part being not different in principle from the ordinary catcher except that it is provided with an automatic latch which secures the pouch from falling after it is taken from the crane. The car catcher is provided with a second arm branching from about the middle of the first one, to the end of which the upper end of the pouch is secured by a snap attachment which will let go automatically. The lower end is attached to a similar snap at the forward jamb of the door. The operation of the apparatus will be readily understood from an examination of the two illustrations, one of which shows the relative positions of the pouches before and the other after the exchange.

The crane is mounted upon the end of a long tie and the two adjacent ties are made sufficiently long to receive wrought iron braces, as shown in the illustrations. A ladder and platform are added for the convenience of the person operating the crane. It is stated that this apparatus works satisfactorily at speeds from 20 to 70 miles per hour, and that this company has developed another arrangement whereby the exchanges may be made with two or more pouches without the necessity of the rings. The crane has been approved by the United States postoffice department and recommended to the railways. The following is quoted from a circular received from Mr. A. P. Hauss, general manager of the company: "This system is no longer an experiment but was in use six months on the P. C. C. & St. L. Ry., between Louisville, Ky., and Indianapolis, Ind. At 23 stations during that period the mail pouches were delivered to and from fast trains 6,500 times and not a single pouch was drawn under the trains or carried beyond the crane." The crane is furnished with or without the receiving attachment. It has been placed upon the following railways during the last eighteen months without the receiving attachment: P. C. C. & St. L. Ry., C. & M. Ry., B. & M. system, L.V.Ry., C. & O. Ry., U. P. Ry., L. E. & St. L. Ry., C. C. C. & St. L. Ry. and the L. & N. Ry.

A trip for record purposes was recently made from London to Paris, special service being employed throughout. The entire distance was covered in 6 hours 32 minutes. From Victoria Station, London, to Dover, 78½ miles, was made in 1 hour 22 minutes 35 seconds, or at 59.9 miles per hour; from Dover to Calais, 25 miles, was made in an hour and a quarter, or at 20 miles per hour; and from Calais to Paris, 185¼ miles, was done in 3 hours 34 minutes, or at 52 miles per hour, including three stops.

THE RAILWAY REVIEW

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THE billet pool has finally admitted that the complications surrounding its organization are serious enough to warrant the calling of a meeting of the manufacturers, which is to be held at New York Friday of this week. The opposition to pool purposes and methods has been continuous and pronounced. There is a large stock of material to be used up before prices can be advanced, even if market conditions fully warranted it. Generally speaking, the iron trade is stale, flat and unprofitable. That vigorous demand which all anticipated earlier in the season is still beyond the horizon. Railway demand from which so much was expected is an unimportant factor. Steel makers earnestly hope that conditions will warrant the prosecution of some of the long deferred enterprises whose consumption of mill and furnace products were to do so much for the iron trade. All we can do is to wait. Prices are weak.

THE paper which appears in another column of this issue upon the subject of flangeless locomotive tires, changes the usual appearance of this question from what is the proper location of the flangeless driving wheels to whether there should or should not be any flangeless wheels on of a locomotive. With little or no allowance in the gage of track to assist engines to take curves and with little lateral allowance between the flanges and the rails it is not surprising that it was found necessary to leave at least one pair of tires of a ten wheel or consolidation engines without flanges, but since greater allowances are now made in tracks, in flanges and in boxes for lateral motion, the blind or plain tire is not necessary. There are authorities for both practices, but those who now favor the blind tires are apparently growing smaller in number and in cases where roads have changed their practice to the use of flanges on all wheels there seems to be no tendency to return to the blind tires. The chief reasons for the flanges on all wheels are that a locomotive so equipped will take ordinary curves more easily, will ride more smoothly on tangents, will wear the flanges less, will be easier to handle after a derailment and will produce fewer strains upon the locomotive structure in general. It has been argued that the smooth tires will cause easier riding on curves, but this is known to be a mistake where sufficient allowance for lateral motion is provided, because of of the fact that if any of the tires are without flanges the work is thrown upon fewer wheels which causes a tendency to grind and cut away the flanges which correspondingly increases the friction. There are other advantages in flanging all wheels which are pointed out in the paper and of all of the arguments in favor of this practice the strongest seems to be that those officers who are placing flanges on all wheels are not going back to the old plan, but find uniformly good results from their present practice In foreign countries flanges are considered necessary and in Germany complications in the form of linkages are put up with in order to keep the driving axles radial upon curves so short as to be impassable without this flexibility or the provision of blind tires. The blind tires are there avoided at great pains and expense.

IT is perhaps too much to expect that the horizon of class journalism will be sufficiently broad to permit its conductors to see very much beyond the sphere of the particular interest with which they are connected, but it would be much better for all concerned were this the case. Particularly noticeable are these limitations in connection with maritime journals the publishers of which apparently imagine themselves watch dogs especially charged with the duty of defending these interests, and as a consequence they growl threateningly at every suspicious object brought to their notice. Anything that "interferes with the free movement of commerce" is strenuously opposed. But the trouble is that their definition of commerce embraces only water transportation. A bridge across the Detroit river so constructed as to permit of free passage of vessels is asserted to be an obstruction to commerce that cannot for a moment be tolerated, notwithstanding that the added facilities thereby afforded rail commerce are equal if not superior to the resulting obstruction to water commerce; while at the same time the detention for some hours of numerous trains because of an open drawbridge, through which some river craft may pass, whose total business for the season would not aggregate five hundred dollars, is passed by as a perfectly proper proceeding, or at least too insignificant to be deemed worthy of notice. That commerce must be given the freest possible movement is undisputable, but that commerce by water is entitled to any precedence over commerce by rail cannot be admitted. If by the building of a bridge over the Detroit river or any other river, the movement of commerce as a whole will be promoted, the bridge should be built, and if on the other hand, the injury to water transportation because of the bridge would exceed the benefit accruing to rail transportation because of the bridge, it should not be built. The main proposition is that the people of the country are entitled to the best possible use of the combined transportation facilities that can be afforded. They are the ones who pay the bills, and nothing that will contribute toward the reduction of this expense should be considered controlling emanating from private interests.

THE report of the statistician to the Interstate Commerce Commission for the year ending June 30, 1895, has been issued, and an abstract of same prepared by the commission will be found upon another page of this issue. This report follows the lines of those of previous years and some interesting comparisons are made. The use of private cars are shown to be on the increase, a fact that in view of the cost attaching thereto on the one hand and the necessity for economical operation on the other, indicates that some reforms are still needed. A great improvement is shown, however, in the use of cars in the fact that while in 1894, 1,888 were required to move 1,000,000 tons of freight, the same service in 1895 was performed with 1,717 cars. There is, however, still room for improvement, for it is shown that the average movement per car per day is only 200 ton-miles—a figure that does not seem to indicate any great demand for additional equipment. The shrinkage in railway rates is illustrated by the constantly increasing percentage of operating expenses to operating income, which is shown to have grown from 65.80 per cent in 1890 to 67.48 per cent in 1895. Perhaps the most valuable feature of the report is the complete answer it affords to the question as to why railway securities are so depressed, and why there is so little inclination abroad for railway investments in this country. The report shows that of the total outstanding stock more than 70 per cent paid no dividends, and of the funded debt nearly 17 per cent paid no interest. It is not difficult to see from this showing why American railway securities are held in so slight favor abroad. The hazardous nature of train service is illustrated by the figures given, showing that of this class of employes one out of every one hundred and fifty-five was killed, and one out of every eleven injured. Serious as is this statement, it nevertheless shows an improvement over previous years, the report for the year ending June 30, 1894, showing one such employe killed out of every one hundred and fifteen, and one out of every ten injured; and for the year 1893 one out of every one hundred and thirteen killed, and one out of every ten injured. Presumably this improvement may be attributed to the growing use of safety appliances; an improvement which it is hoped will be continued. Like its predecessors the report is worthy of careful examination and forms a valuable addition to the railroad literature of the country.

IN A report which recently appeared in a daily paper giving an account of a fatal accident which occurred at a side track switch carelessly left open by some unknown agency, the responsibility of which is hard to place, a statement was published wherein the locomotive runner remarked that he did not consider it a part of his duties to see that side track switches were set for the main line before he arrived at them. The fact that this switch was protected by a semaphore signal did not seem to alter the case. He considered that he had a right to expect switches to be always set properly for a main line train and that it was unnecessary for him to take any steps to see that the way was clear in this respect. Neither the previous record of the man nor length of his service upon the road in question are known, but it is to be hoped that such sentiments are not as common as one might be led to expect from several remarks of this sort which have recently been made, few of which, however, find their way into print. The number of duties which devolve upon the locomotive runner in charge of any train upon the main track are numerous and the small number of fatalities which are traceable to their neglect or forgetfulness is remarkable. In fact, these accidents are so unusual that it does not seem necessary for an excuse of this kind to be offered. It might with equal force be claimed that trees and similar obstructions which are liable to be thrown across the tracks by accident should not be expected by a locomotive runner, therefore, that he should not be responsible for striking them when the conditions are such that they might be seen. This subject would have but slight importance were it not for a tendency apparent among those who investigate accidents of this character, to relieve engineers from responsibility where the wrong position of switches is concerned. A case occurred last year on a road in the east, where a fast passenger train came into collision at a switch with a switch engine, which was working over a switch in the main line upon the time of a passenger train. This switch was protected by a semaphore signal which was placed from safety to danger position when the approaching passenger train was either very close thereto, or after the locomotive had passed it. In the conflict of testimony it was impossible to decide just when the semaphore changed its indication and the locomotive runner was exonerated, the entire blame for the accident being placed upon the switching crew. An interesting question is raised by these two accidents in that both involve the use of switch semaphore signals which were in neither case treated as distant signals. The question is should not these signals invariably be considered as caution signals? They are never, so far as is known, regarded as positive stop signals although they may, and usually do, show a red light in the danger position. It is held that in both of these cases the locomotive runners neglected to notice the position of the switch stand which is the home signal and the examining officers called upon to decide the responsibility apparently did not consider this point as an important one. It is believed that the real meaning of a semaphore signal connected to a switch at a distance, would be more clearly conveyed to a locomotive runner if the signal were placed upon a basis of the usual interlocking practice which would make it merely a cautionary signal and would not in any way excuse the failure to observe the position of the switch target.

THE practice of planning to save labor is a good one to follow in many different directions, and perhaps the best example of thinking first and constructing afterwards is in the employment of a drafting force to plan and arrange the details of construction about locomotive and car repairs. There is an opportunity offered by such work to save a great deal of money and time by spending a little of both.

The direction in which perhaps the best returns may be made is in the simplification of the construction and the arrangement of sizes of parts whereby each piece will be made to fit in as many different places as possible. Special wood working machines have contributed largely toward improvements in car construction through the rapidity of working due to the turning out of the greatest number of pieces with one setting of the machine. The same idea may be made to apply to locomotive construction to a much greater extent than is ordinarily practiced. In this case it is not only a saving in machine work but in the number of parts which must be carried in stock for repairs. Of course the duplication of parts renders building cheaper but this applies with equal force to maintenance with particular reference to such parts as require comparatively frequent removal. Among those which may be standardized with good effect, or if not standardized, which may be arranged so as to make one size fit as many locomotives as possible, are, pilots, stacks, exhaust pipes, cylinder heads and cabs. There are other parts equally well adapted to the systematizing process but attention has been called specially to those mentioned during a recent visit to the west Chicago shops of the Chicago & Northwestern Railway. It has been noted in these columns that there are but three sizes of pilots now used n repairs for all of the locomotives on this road, these three being arranged so as to be adjustab e to reach a number of different hights of engines. This furnished the means doing away with a large variety of pilots each differing but slightly from others. These three sizes are also used on new locomotives and the simplification of the repair work as well as the possibility of reducing the stock of repairs to three sizes, is ample return for the trouble of the drafting work necessary to arrange this plan. It has been found possible to systematize smoke stacks and exhaust nozzles in the same way, three of each being designed to meet all the conditions found in different engines. The three patterns for exhaust nozzles take the place of more than a cord of patterns formerly used, the space for storage in this case being an item worthy of consideration. The systematizing of cabs was a more difficult matter but in that a reduction from over one hundred different styles and sizes to eight has been secured. There are other directions where progress has been made, for instance, in the case of back cylinder heads. The depth of these castings varies considerably and a drawing which has just been finished which makes one casting answer for all cylinders of each diameter. The shallowest head as measured from flange to steam joint is selected as the standard head of each diameter and the variations found necessary are taken care of by making the guide blocks of the proper length. This makes it possible to standardize the back casings as well as the heads which adds to the value of the plan. The idea of standardizing may easily be carried so far as to prevent the use of the best designs of parts and to interfere with the advancement obtained by experimenting with improvements, but this form of simplification is not of that order and where there are no good reasons for not using similar castings for various types of engines this plan can be followed advantageously. The desirability of calling attention to the advantages of this idea, was illustrated by recent examination of a new design of caboose in which all of the posts on one side of the car were of different lengths, which was probably done with a view to getting the camber of the car in this way. This is no doubt an extreme case but it indicates that the simplification idea is not everywhere appreciated.

THE TRACK ELEVATION PROBLEM IN CHICAGO.

THE interest in track elevation in Chicago centers in the disposition of the mass of crossings at Sixteenth and Clark streets, a diagram of which was published in our issue of January 11, 1896. The aldermanic committee has been struggling with the problem with much assistance from the engineering departments of the roads involved, and several plans have been considered upon which it was found impossible for the roads to agree among themselves and with the committee. The upshot of this is that the committee has recommended an ordinance to the council which is designed to relieve the situation as far as the grade crossing with Clark street is concerned, but which does nothing to separate the grades of the railroads. If this ordinance passes, Clark street will be depressed five feet and all of the roads will be elevated uniformly to a hight of ten feet above their present grades at that street. As far as the elimination of the dangers to the street traffic is concerned the relief is ample, but the situation for the roads will be worse than at present, which has been thought to be impossible until this plan was conceived. The proposed disposition is unsatisfactory and while the committee may be able to convince themselves that their responsibilities end with the protection of the travel upon the street, it is unfortunate that it could not have been induced to lend its influence to the acceptance of a sensible and safe disposition of the tracks at different grades. Such a plan was all but adopted by the roads and it is believed that the committee might have accomplished an improvement, the value of which cannot be estimated. This plan was proposed by the Chicago & Western Indiana Railroad and provided for the raising of Clark street seven feet above the existing grade. The approaches to this elevation were to be upon a grade of three per cent and the tracks of the Chicago & Western Indiana and the Santa Fe were to go under the street through a depression seven feet deep. The Rock Island and Lake Shore tracks were to be raised ten feet to allow the Western Indiana and the Santa Fe to pass under them and the St. Charles Air Line was to be elevated twenty-seven feet. This would have eliminated all of the difficulty and would have cleared the country of its worst grade crossing, but the plan was objected to by the St. Charles Air Line on account of the expense of raising their tracks twenty-seven feet. It is hoped that some means may be decided upon whereby these crossings may be removed. There is a possibility of saving the expense of maintenance of in the neighborhood of one hundred sixty four crossing frogs at this point which with the heavy traffic handled there would help pay the interest of quite an investment for the separation of the grades, and with the avoidance of the stopping of all of the main line as well as all other trains at this place, there would seem to be enough to be gained aside from the elimination of the dangers to traffic to repay the cost of the proposed arrangement.

It is of course understood that the above remarks are predicated on the theory that the present terminals of these various roads are to be perpetuated. The proper solution of the whole question would be an entire change of program, and the removal of the freight handling business (except so far as Chicago local traffic is concerned) to a point or points in the outskirts of the city. It is probable, that however the existing difficulties are sought to be overcome by means of elevations and depressions, sooner or later a radical change of system and method will have to be adopted. The sharp competition for business will not permit the present heavy expenses for teaming and city warehouse rents to continue indefinitely, to say nothing of the congestion of traffic to which Chicago streets are now subjected because of the large amount of transfer freight necessarily hauled thereon. It is true that in this connection many things must be considered. The railroads have expended large sums of money in providing terminals in the heart of the city, many of which would have to be abandoned and some portions of which, because of their acquirements through condemnation proceedings, might possibly revert to their former owners. So also with respect to the warehouse facilities now located in the heart of the city. Many of these because of the lessened demand for storage, would be much diminished in value. Wholesale houses, now occupying these immense downtown buildings would then require simply office and sample room, all stocks being carried in cheap warehouses in the vicinity of the general transfer station and reached by side tracks. These and other considerations which might be mentioned will be found to constitute a powerful factor against such a removal, but in a case of this kind private interests must of necessity give way to public convenience. It would seem therefore, that instead of accepting any of the proposed methods for overcoming the difficulty, it would be far better to take steps looking to the adoption of a plan that will settle whole question.

DRASTIC MEASURES NECESSARY TO CHECK RATE DEMORALIZATION.

The western railroads are just now employed in furnishing to the various rate making authorities of the different states throughout the country, abundant evidence that the present basis of rates is altogether too high. At time of writing the proportional rate on wheat from Kansas City to Chicago is twelve cents and on corn nine cents per hundred pound. The corresponding rates to St. Louis are five cents per hundred less. On local business, that is to say, originating in Kansas City and terminating at Chicago, the rate on wheat is fifteen cents and on corn twelve cents per hundred pounds, and if the statements of some traffic men are to be believed, rates will go much lower. We had hoped that the day of such foolish exhibitions were past; that railroad men having learned by experience that railroad rate wars never determined anything except loss of revenue, would be more chary of engaging in such contests. But it would appear that such is not the case. In the present instance no one seems to be able to state the object for which the contest is being waged. They only seem to know that each one is going about with a chip on his shoulder anxious for some one else to knock it off.

Two things are prominently brought into notice by the present strife. The first is the so-called proportional rates or transit privilege which has for so many years illegally, as we believe, been in existence at the Missouri river and elsewhere. This arrangement is all the more strange as being instituted and defended by railroad men, because its only effect so far as the railroads are concerned is to reduce the revenue on business on which they would otherwise receive full tariff rates. It does not induce the movement of a single bushel of grain that would not in any case come forward, and wherever employed sooner or later operates as a disturbing element. It is without doubt of more or less advantage to the dealers at the points where it is in force, but why the railroads should be its principal advocates is past comprehension, yet it is a fact that it owes its continued life to the refusal of the roads to abrogate it, rather than from any other cause. In addition to this many railroad men believe the practice to be a violation of the law and yet continue the proportional rates in effect.

The other point specially noticeable is the long established but wholly indefensible differential as applied to grain destined to Chicago and St. Louis respectively. For many years this has been five cents per hundred pounds regardless of the point of origin or amount of rate. If memory serves, it had its origin in the days when the Missouri river formed the dividing line across which rates did not proceed, but as the tariff area was extended west of the river, the differential followed, until rates in the entire west were formulated upon that basis. No argument is needed to show that a differential of five cents between Chicago and St. Louis cannot equitably apply upon grain which originates at Kansas City, and that which comes from a point three to five hundred miles west of Kansas City; nor can it any more equitably apply when rates are ten cents per hundred pounds and twenty cents per hundred pounds between the Missouri river and Chicago. The truth of the matter is that no one attempts to defend the arrangement. It is simply insisted upon by the lines in interest.

To come back to the proposition with which we started, it is at least debatable, if, under the circumstances, the legislative rate making authorities in this country would not be justified in applying a drastic remedy, such, for instance, as giving notice that the published tariff of any railway could not lawfuly be advanced for a period of six months without permission of the railroad commission of the state or United States, as the case might be. The suggestion may seem strange, but appearances indicate that the people who own the railroads need to be protected against those who operate them. If possible to be had it would doubtless be better to authorize the publication of a lawful minimum as well as maximum rate, but as this seems to be impossible, perhaps the above suggestion if adopted might not be so objectionable in its practical workings as appears at first sight.

SHOP NOTES—ILLINOIS CENTRAL RAILROAD

1. Car Department.

A visitor to the Burnside shops of the Illinois Central Railroad which are situated on the main line twelve miles south of Chicago, will find the car shops very busy at present particularly in the passenger car painting department and in the freight repair shop. The suburban passenger equipment consisting of about 600 cars in all, is being repainted from the former yellow color to the new standard which is an olive green. About 90 of the suburban cars yet remain to be painted and in addition to these there are a number of main line cars, which have not yet been changed. The equipment is ample for work of this character and it is stated that in the neighborhood of 60 or 70 cars per month might be handled at this shop, providing that a large proportion of them did not need to be burned off. Fifty-four passenger cars were painted in June of this year of which 24 were burned off, the force employed in the paint shop being less than 80 men in all. The arrangement of the shop and dimensions were given in the article illustrating and describing the new buildings which appeared in the Railway Review of September 21, 1895. A noteworthy feature of this paint shop is the series of skylights which are placed in three lines in the roof, giving light through one-half of the area of the roof. The next building, the passenger car repair shop, is nearly as well supplied with light, two-sevenths of its roof being of glass, whereas one-quarter of the freight repair shop admits light. Another feature of the paint shop is the remarkably neat and well kept paint store room which is supplied with numerous shelves, for stock in cans, extending across one side of the room below which are cases of drawers for small articles, such as brushes, and projecting out into the room are rows of tilting bins covered by a counter from under which the bins may be tipped forward. These bins have small glass windows through which the amount of stock may be seen. They are used for the storage of dry pigments which are kept in considerable quantities. The barrels containing the mixed freight car paints are placed together at one side of the room and are enclosed upon the front side with an apron of wood which, when let down, forms a platform and keeps the drippings from soiling the floor. The floor of this room, like that of the entire paint shop, is of concrete.

The work of burning off passenger cars is done very cheaply at these works with the assistance of a carburetting machine which has been developed and built at these shops. This device will be illustrated and described in detail in a future issue. It consists of a large tank containing gasoline, mounted upon a four-wheel truck. Air from the supply mains is passed through the liquid and after being carburetted it is supplied to eight burners which may be used either upon a single car or, as the hose connections are quite long, they may be used for burning off two cars standing upon adjacent tracks. The burners are light in weight, and one man does the burning and scraping, instead of the practice in many shops of employing one man with a burner and another to scrape off the old paint. The cost of burning off a passenger car, with labor at 15 cents per hour, is $4.50, including 70 cents for the cost of the gasoline used. The capacity of this shop is sufficient for working upon thirty-four cars at a time. Mr. H. G. McMasters, foreman painter, is now experimenting with a sand blast machine for preparing ground glass, and also for removing the paint from water coolers, locomotive tanks and other metallic surfaces. The sand removes the paint rapidly and leaves the surfaces perfectly clean and producing minute indentations which leaves them in good condition for the reception and the adherence of the new paint. The apparatus consists of an air brake auxiliary reservoir which has its axis placed vertically and is filled with screened sand. An air pipe enters the top of the reservoir, which brings the pressure upon the surface of the sand, giving it a tendency to pass out of a second pipe at the bottom, which enters the middle branch of an ordinary T. Another connection to the air pipe passes straight through this T and blows the sand into a hose, which is fitted at the end with a piece of ordinary ¾ in. gas pipe as a nozzle. Scrap material was used and the device is therefore a cheap one to construct.

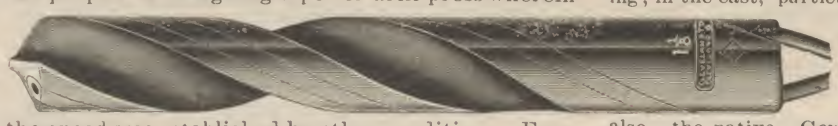
In the freight car repair shop ten new standard cabooses were found under construction. These are of a new design and are equipped with the M. C. B. couplers of the "Standard" make and with air brake pipes, though they are not equipped with air brakes. This shop was found full of cars undergoing heavy repairs. It has a capacity of 44 cars on the shop tracks, and from the shops and the light repair yards from 50 to 100 cars per day are turned out. In the month of June 1,340 Illinois Central freight cars were repaired, which together with 485 foreign cars, made a total of 1,825 cars repaired. There are 620 men now working in the car department. There is room for about 400 cars in the light repair yard, which is provided with five tracks, between every two of which is a push car track. A number of the refrigerator cars are being equipped with air brake pipes without air brakes, and automatic couplers are being put on as rapidly as possible. An interesting combination car was seen which was prepared as a sample in the development of a car for fruit and refrigerator transportation. A false floor is provided for ventilation, and the end ice tanks, as well as the floor, are removable, so that the transformation may be easily made, and the cars kept continuously in service, though they are not needed for either service all of the time. An improvement in the standard freight draft rigging was noticed which consists in increasing the strength of the cast iron draw-bar stops and the provision of chafing plates to receive the end wear of the follower plates and prevent them from cutting into the draft sills.

A characteristic feature of these works is the ample floor space provided and the abundance of light and ventilation. The Sturtevant blower system which is used in the winter for heating the shops, is now employed for ventilation and greatly assists in keeping down the temperature of the buildings. The machinery in the mill is nearly all new, and with an available floor space of 160 by about 240 ft., the arrangement of the machinery might be expected to be perfect. It is, however, not so, and it is particularly noticeable that an improvement might have been made in the location of the machines for handling large timbers, such as car sills.

Notes on the locomotive department will be given in the issue of next week.

TWIST DRILLS WITH OIL TUBES.

The duty which is expected of twist drills is increasing with astonishing rapidity. It is reported that a test for the pressure placed upon a perfectly new twist drill of ⅝ in. diameter required to feed it under a speed of 150 revolutions per minute at the rate of 1¼ in. feed per minute, was between 700 and 750 lbs. In view of this the necessity for lubricating drills of this type is apparent. This pressure was reported by the mechanical engineer of the Northwestern road as the result of investigation made for the purpose of designing a power drill press wherein



the speed was established by other conditions. Even where the pressure is not so high it is necessary that lubrication of the cutting and bearing surfaces shall be satisfactory and inasmuch as the close packing of the chips will not admit of proper lubrication by gravitation when holes are deep, it is necessary to provide other means for getting the oil down where it is required. The Cleveland Twist Drill Company of Cleveland, Ohio has brought out the oil tube drill shown in the accompanying illustration, which is supplied regularly by these manufacturers for the purpose stated. Midway between the large grooves upon each side of the drill, a groove is cut with a milling machine which is just deep enough to admit of inclosing a small brass tube which is then soldered in place making a smooth surface as ordinarily provided for in twist drills. These tubes terminate at the lower ends in openings which discharge the oil directly at the cutting edges of the drill. The upper ends of the tubes project from the shank of the drill and through these the oil is forced. The illustration shows a drill 1¼ in. in diameter with a straight shank. They are made in the the regular sizes from ¾ to $1\frac{5}{16}$ in. in diameter and with taper as well as straight shanks. Another feature of this device is that with the rapid flow of the oil from the bottom of the hole to the top, the drill is not allowed to heat and also the chips are materially assisted in their removal from the hole by the stream of oil passing upward from the bottom under pressure.

During 1895, 183 new locomotives were submitted to official inspection in Austria, an increase of 83 over the year 1894. Of the total, 44 were built in the works of the Austro-Hungarian State Railroad Co., 62 in the Sigl Works, at Neustadt, 54 at the Floridsdorf Locomotive Works, 19 at the works of Messrs. Krauss & Co., at Linz, 1 by the Prague Iron Industry Co., and 3 in the works of Messrs. Krauss & Co., in Munich.

RECENT IMPROVEMENTS IN PERMANENT WAY.

In a paper by Mr. Benjamin Reece, read before the Technical Society of the Pacific Coast, and published in the Journal of the Association of Engineering Societies, attention is directed to the chief improvements of present over former practice in track construction. The principal points of the paper are presented below as well as the discussion which followed the reading:

As a fastening, the angle bar appears to be growing in disfavor. Much was expected of the long angle bar supported by three ties which was first applied on the West Shore Railroad during its construction in 1881 and 1882. That it has not given the satisfaction expected of it is evidenced by the fact that many of the lines who have used it have returned to the shorter bars. On the lines ranging through Indiana and Ohio, I have heard it claimed by engineers that, when tightly bolted, the long bars offer sufficient resistance to the expansion and contraction of the rail as to kink in the one case, with the tendency to break in the other. Of course, when the bolts are loosened, the joint is necessarily imperfect. Mr. Torry, chief engineer of the Michigan Central, has been experimenting with rails, 500 ft. and 800 ft. respectively, using expansion joints for same. These rails were very closely watched, observations being taken as to expansion and contraction three times daily. Mr. Torry is so well pleased with the result as to make a further experiment covering a mile of track. As you all know, some lines have used and are using rails of 45 and 60 ft. in length, with a view of eliminating the joints Several new joints, generally patented devices, have been placed upon the market, many of them having secured recognition on important lines, and are said to be giving good results, covering from two to four or even five years of service. The trouble with the angle bar rests in its limited bearing surface under the head of the rail. This in a few years results in the wear of the angle bar and a corresponding wear of the under head of the rail at the ends of same. In 1879 I put a cold cutting rail saw to cut off the dipped ends of a 30 ft. rail, reducing them to 28 ft. lengths. With these I laid branch track, attempting to use the old angle bars, but found a movement of the rail from the start. Upon examining the bars I noticed them sufficiently worn as to leave a well defined piece of metal in the center in the shape of an inverted V where the angle bar had been more or less protected by the expansion opening left between the rail.

It is because of this feature that nearly every joint of recent design involves the bridge affording the rail an under support resting upon and bridging the space between two ties. That a radical change in this fastening of rail joints will shortly come about I have but little doubt.

While the main expense of maintenance is that of labor, it is to be regretted that as a general thing the personnel of the section gangs throughout the country is deteriorating; in the east, particularly the Italian is gradually displacing the older section hands. In the south possibly the negro laborer may be improving, certainly he ought to be if he benefits by experience. In the Middle States also the native German and Irish section hands are gradually giving place to laborers of a lower grade; this of itself demands more constant and better supervision and the introduction of all available checks upon them to secure that thoroughness of work which alone can make refined and and enduring track. It is a good sign, however, that recently, while on an inspection trip on the Illinois Central, I saw a roadmaster censured by the chief engineer because the new rail, just laid, showed a sixteenth of an inch open gage.

After many years experience I am fully convinced that track can be laid to a perfect gage in renewals at very little greater cost than when careless and hastily done. Such track, throughly tamped and well lined, is not only enduring but the most economical in the end. The refinements of a main line are not required upon the branches, but even on these throughness of work up to the standard of excellence required, insures permanence and less cost than the constant botch work which not infrequently prevails on lines where the hand car, moving from point to point, is in more frequent use than other tools. The proper policing of the track is undoubtedly of great moral benefit to the man, but well defined lines, uniform section of ballast and track properly cleaned of grass is conducive to an *esprit de corps*, which is made manifest in more energetic and ultimately in more intelligent labor. In comparing the cost of maintenance on different lines in the various state reports and other sources, it has been my experience that, as a rule, on lines of similar traffic, those showing the cleanest rights of way and best defined roadbeds, have shown the lowest cost per mile.

Twenty years ago the cost of rail renewals, next to labor, was the largest item of expense. At this time, although the Bessemer steel rails were much more expensive than iron, yet they were being very generally introduced upon our railways, the enormous annual cost of the renewal of iron rails having almost threatened the life of our railway system. With the cheapening of coal the development and opening up of Bessemer ores on Lake Superior the cost of Bessemer steel rails has been so reduced that their present market price is not more than 40 per cent of the cost of iron in 1872. Not so with ties, however. The gradual reduction of our forests, particularly in the older section of the county, has tended to a constant increase in their price, and where, under the moderate traffic of that early period, they gave service until re-

moved by the cause of decay, they are now frequently destroyed prematurely by the action of the rail under the heavy wheel loads, higher speeds and increased traffic of to-day. So that while the cost of rail renewals were four or five times those of tie renewals in 1872, the figures were almost reversed and ties next to labor have become the most considerable expense in the maintenance of way and the cost of tie renewals are now from two to four times the cost of rail renewals, according to the location of the line upon which the comparisons are made. For many years this question of ties had received but little attention. What had been true in an early day was supposed, or as least assumed, to be measurably true to-day. As the question was agitated and studied the question arose as to how the cheap softer woods could be made available for use under heavy traffic. Some of these woods are very enduring against decay. Such are the cedars of the lake region, the cypress of the Gulf of Mexico and the red woods of California, but their usefulness was much impaired by reason of their cutting in and being destroyed by the action of the rails. Other soft woods which could be secured at low cost were susceptible of chemical action which would add greatly to their lives, but like the more enduring groups they were rapidly destroyed by the action of the rail. In the treating and mechanical protection of ties the Southern Pacific line has been one of the most fearless and at the same time successful pioneers.

Perhaps in the whole range of maintenance of way, the most striking feature is the revival of tie or wear plates which are now being very generally used throughout this country and Mexico. Plates were early used, but were of such designs that they only partly saved the tie and introduced difficulties almost as objectionable as those which they were intended to correct. The first designs were based upon the mistaken assumption that the tie was destroyed by the direct crushing down of the fiber by the indentation of the rail, whereas the breaking down of the first wood cell is followed by rasping and throwing out of the fiber of wood, due to the slight forward and backward movement of the rail. Any one who has observed a cut tie must have seen that the cut sides are walled up almost as if cut with a saw. There is no drawing down of the fibers as would have been the case had it been the result of indentation. This error led to the idea that a greater distributive area was required, and induced the development of long wide plates to support the rails, whereas in fact it was only needed to confine and protect the wood fiber from being displaced by the rail, and thus confined, after being compressed so far, sawdust itself would have supported it. You will at once see that a long thin plate would necessarily curl at the ends and a constant thickening to avoid this evil was the result. The plates being loose would jump from the tie, give out a disagreeable metallic ring, and would indent the tie sufficiently to leave a receptacle for water, which the undulating rail acting upon the plate would literally pump into the tie, and hence cause premature decay of the tie under the rails. Nor was this all. The heavy plates working loose from the tie acted as anvils under the rail as they received the shock of every moving wheel. This led to a spotting of the rail by reason of lamination, and some 40 miles of such plates having a shoulder abutting against the outer flange of the rail were removed from the Pennsylvania over twenty years ago. The early experience with such plates was such that they were universally condemned, and it is only through the long success of applications hesitatingly made that the revival has become complete.

Before rail movements had been closely watched it was assumed that a well spiked and well bedded rail could not be turned over by the moving train. It was also assumed that the engine exerted a direct lateral thrust, sufficient to overcome that exerted in the direction of gravity from which it derives its tractive force. The fallacy of this is at once apparent. This suggested the use of rail braces, which are now recognized as failures. It also suggested the outer shoulder on the plates, which, though of some little advantage in saving the spike from the wear due to the slight undulations of the rail, necessitates modifications of designs at once injurious to both tie and plate. The theory is that the shoulder will protect the spike from abrasion, but manifestly if the plate has a plain under surface, the rail pressing against the shoulder will cause the plate to impinge upon the spike and wear it away, where it cannot be seen, which is even worse than where the same conditions exist in the light of day, visible to trackwalkers and section men. This led to spurs, prongs and flanges which cut the tie transversely of the grain, in order to hold the plate securely against such movements, but with the constant vibrations of passing trains the transverse openings thus made in the wood are widened, and as the tie softens they loose their hold at the very time when the plate is supposed to be of greatest value. The development of the last eight years has shown that where the hook head spike is used to fasten the rail to the ties, that any successful tie-plates must automatically unite themselves to the tie, becoming practically an integral part thereof. This has been fully accomplished by the use of plates having longitudinal flanges, which separating without splitting the grain of the wood, and so fixing themselves firmly to the tie in the general form of a channel iron, have been found very effective.

I need not call attention to the fact that the channel iron form is parttcularly well adapted to confining and protecting the wood fiber from displacement by the rail. I have seen a plate of this type 3¾ in. wide by 8 in. long protect a chestnut tie in the tracks of the New York, New Haven & Hartford Railway for six years, when adjacent ties unprotected had been cut down by the rail, having 5 inches width of base, for more than an inch in depth. In the indentation of timber its structure is such that it is pushed out transversely and does not elongate; hence with timber at all fibrous such plates become tighter and tighter with use, and in the case of oak when being removed, I have seen them lift out bodily from a tie the wood lying between the flanges of the plate. Many minor changes might be enumerated, but time will not permit. I am, however, glad to say that more and more attention is being attracted to maintenance of way, and there is a is a growing disposition to select technically trained men for the supervision of the work, which gives promise of a wider field of labor for the civil engineer.

Mr. J. H. Wallace—Using, as we do on this coast, a soft redwood tie which is rapidly cut out under the rail, but which, when not destroyed in this way, will resist decay for many years (we have ties in sidings that are perfectly sound after forty years of service), we early began experiments looking to the adoption of some method to prevent this cutting, and thus lengthen the life of the tie.

At first we labored under the same mistake as others referred to by Mr. Reece, and supposed the wear was due to the crushing of the fibers of the wood by the load put upon them. With a view to overcoming this, it was at first suggested that larger ties be used, spaced closer together, thus endeavoring to diminish the pressure per square inch on the wood.

Efiorts in this direction had not progressed far when it became evident that the wear under the rail was due not to the destruction of the fibers by compression, but to their being gradually ground or worn away by the longitudinal motion of the rail, aided by the sand and grit which found its way between the rail and tie.

The remedy for this is undoubtedly the use of tie plates. As yet our experience with them is limited, but so far as we have gone we are very well satisfied they are going to make the redwood ties last about three times as long as formerly.

Mr. W. G. Curtis—I might say in corroboration of Mr. Wallace's remarks that probably not 1 per cent of the redwood ties removed from the tracks are removed on account of decay. The failure is almost invariably due to the cuttitg out of the tie under the rail.

About ten years ago we put some experimental plates upon the redwood ties on the shore end of the Oakland mole, watched their wear and kept a record of them. The ties were cut down about 1¼ in. under the rail by the passage over them of about thirteen million tons of trains. The life of the redwood tie is not measured by time, but by the traffic.

We have ties in sidetracks to day, a few, that were laid, I think, in 1856, forty years ago, and they are still perfectly sound and are good ties. Of course but little traffic has passed over them.

We experimented on the Southern Pacific lines ten or twelve years ago with plates, and our course has been very much like that described by Mr. Reece. We had the idea at first that a greater bearing area was needed, and made very large plates. We were disappointed to find that they did very little good, and finally came to the same conclusion Mr. Reece has presented, that it is the rasping motion, the sliding motion of the rail upon the tie, almost imperceptible though it be, that cuts out the wood. We tried fastenings that would secure the rail, plate and tie more closely. In one experiment we used a "U" bolt passing through the tie, with the nuts at the upper ends, and washers so shaped as to engage the rail flange, in this way fastening the rail and tie together; but even that did not seem to meet the requirements. As a result of our experiments, our conclusion is that a plate, to be effective, must either be very heavy or be attached to the tie; and as a plate that can be attached reasonably well to the tie can be made very light, and at a much lower cost than a heavy plate, our ultimate conclusion has been in favor of the smaller plate attached to the tie.

ON SMOKELESS COMBUSTION AND BOILER-FIRING.

The statement, common in text-books, that carbon burns to carbonic acid when enough oxygen is provided, and to carbonic oxide when the supply is insufficient, was shown to be erroneous some years since. The character of the gaseous products depends largely upon the conditions of temperature and pressure, the quantity of oxygen present being only of importance when subsquent application of those products is in question. At a low temperature, carbonic acid, with merely traces of carbonic oxide, is formed, whether the supply of oxygen be much or little, while at higher temperatures carbonic oxide preponderates, with a very small amount of carbonic acid. Thus the gases from charcoal burning at a dull red heat in air contained 13 per cent of CO_2 and 8 per cent. of oxygen; but when the temperature was raised to a brilliant white heat by the blowing in oxygen, CO_2 fell to two per cent, although considerably more oxygen was present in the second than in the first experiment. In another case, a gas producer fed with coke and brought to a strong heat by a free supply of air was allowed to cool down slowly, and the composition of the gas was determined at regular intervals during cooling, no excess of oxygen being present at any time. The results were:—

	Beginning.						Ending
CO_2 . .	4.4	7.2	11.0	14.8	16.5	18.9	19.8
CO . .	23.8	20.6	15.8	7.1	1.7	1.0	0.0

The influence of pressure, however, is in the opposite direction to that of temperature, or towards higher oxidation. Carbon in this respect behaves similarly to sulphur, which burns in the air to SO_2, but when the combustion is effected with oxygen in a closed vessel at 41 atmospheres pressure, the gas contains 65 per cent. of the sulphur as SO_3 and 35 per cent. as SO_2.

At the request of the Saxon Society of Engineers and Architects, Professor Lewicki and the author have examined a number of steam-boiler furnaces selected as types among those that had been reported by inspectors either as smokeless or as smoking badly, and have arrived at the conclusion that the most important condition to be fulfiled is proper stoking. Any, and all, mechanical appliances are insufficient to prevent smoke, if the air supply is not exactly right, while the ordinary plain grate works admirably if it is intelligently handled. The generally prevalent opinion that there is a great loss of fuel in smoke is incorrect, as even in smoky flame only traces of carbonic oxide and marsh gas were found. The principal condition for smokeless combustion is a high flame temperature. Smokeless firing may be effected with the ordinary grate if the fresh coal is uniformly spread over it in a thin layer; but a simpler method is to push the fire back to make room for the fresh coal in front.

A most important matter is the use of sufficiently deep fire-bars, which should be of uniform section throughout. These are useful as a means of heating the air before it enters the fire, and reciprocally the latter cools the bars and so tends to preserve them. It often happens that in providing a very large heating surface in boilers the necessity of an air-tight external casing is overlooked. This is especially the case with water tube boilers set in brickwork and fitted with large cast iron doors, the former being very permeable, while the latter warp under the heat, and cannot be kept tight. In such cases it is absolutely impossible to get a high proportion of carbonic acid in the gases, and if it does not exceed eight or nine per cent the result, even with the most perfectly arranged heating surface, will always be bad. In this respect internally fired boilers are far better as, the fire being enclosed in an air-tight tube, the air supply can be easily regulated so that there shall be no unnecessary excess, at any rate at the place of the most active combustion. The fire grate is also in the most advantageous position for giving a maximum transfer of heat by direct radiation. In such boilers it is easy to obtain 15 per cent of carbonic acid in the chimney gases, or even 18 per cent under the most favorable conditions.

The proper regulation of the air supply cannot be too strongly insisted upon, and the composition of the gases should be regularly determined, either by analysis or gas balance. As the maximum heat transfer takes place from the hot flame the degree of combustion is of more importance than the sensible temperature in the chimney. Thus a boiler giving off gases with 15 per cent of CO_2 at 300 deg. C. is far more effective than one in which the proportion is reduced to 7 per cent, even though the chimney temperature may be only 150 deg.—[Inst. C. E. Foreign Abstracts.

Bad Wreck on the Philadelphia & Reading Railway.

A very serious passenger wreck occurred on the evening of July 30 at the crossing of the Philadelphia & Reading and the Pennsylvania railroads, about four miles from Atlantic City, N. J. The reports which are received just before going to press are rather indefinite, and it is hoped that subsequent accounts will not increase the number of fatalities, which are placed at forty-one, with fifty-six severely injured. The Atlantic City train, leaving Philadelphia at 5:40 p. m., struck a Pennsylvania excursion train upon a crossing. The responsibility for the accident is not yet established, but it is probable that the trouble occurred through a failure to observe signals.

NOTICES OF PUBLICATIONS.

"DECIMAL CLASSIFICATION AND RELATIVE INDEX FOR LIBRARIES, CLIPPINGS, NOTES, ETC." Fifth edition, by Melville Dewey, A. M., secretary University of the state of New York and director New York state library. Published by the Library Bureau, Boston. Flexible binding, leather, 593 pages.

This book stands at the head of the literature upon classification systems for library and catalog work. The plan upon which Mr. Dewey's system is arranged divides the fields of knowledge into nine main classes which are numbered by the digits one to nine. Cyclopedias, periodicals, etc., so general in character as to belong to no one of these classes particular are marked with a zero and form a tenth class. Each class is similarly separated into nine divisions, general works belonging to no special division, having a zero in place of a division number. The divisions are similarly divided into nine sections and the process is repeated as often as necessary. Thus: 512 means class 5 (natural science), division 1 (mathematics), section 2 (algebra) and every algebra is numbered 512. The books on the shelves and the cards in the subject catalog are arranged in simple numerical order, all class numbers being decimals. Since each subject has a definite number, it follows that all books on any subject must stand together.

These tables show the order in which subjects follow one another. Thus 512 algebra preceeds 513 geometry and follows 511 arithmetic. The first summary shows the ten classes into which all the topics are divided. This is followed by a second summary showing the nine divisions of each of the ten classes and gives a bird's eye view of the whole scheme on a single page. Then follow ten pages, one for each class, showing the nine sections into which the nine divisions of each class are divided. After these three summaries is the complete classification which repeats in proper order all the classes, divisions and sections with all the sub-sections given under each section. After the tables is an index in which all the heads of the tables are arranged in one simple alphabet with the class number of each referring to its exact place in the preceding tables. This index includes also, as far as they have been found, all the synonyms or alternative names for the heads and many other entries that seemed likely to help a reader to easily find the subject sought. Instructions are given for the use of the index and at the close of the work a supplement gives additions to the list, which have not been incorporated in it. The chapter entitled "Introduction" is a treatise upon cataloging as well as an explanation of the Dewey system and it contains a large amount of information which would be valuable to anyone in instituting a system for the filing and cataloging of papers or books whether the collection be in a private library or one intended for the use of a number of persons. This work is the most complete that has ever been written upon the subject and it should be in the library of everyone who is troubled by the question of how to classify and file books, papers and clippings. The system is also applicable to the filing of drawings and to the numbering of parts in manufacturing industries as well as to many branches of business and professional clerical work in which classification and systematic disposition of papers is necessary.

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, n the second Tuesday of each month.

he Engineering Association of the South meets on the econd Thursday of each month at 8 p. m., at the Cumber nd Publishing House, Nashville, Tenn.

nnual meeting Traveling Engineers' Association, Minneapolis, Minn., Sep. 8, 1896, W. O. Thompson, secretary 415 Marion street, Elkhart, Ind.

Annual Convention Roadmasters' Association and Road and Track Supply Association, Cataract Hotel, Niagara Falls, N. Y. second Tuesday in September, 1896.

The Railway Signaling Club holds its meetings in Chicago, Ill., on the second Tuesday of January, March, May. September and November. G. M. Basford, secretary, 818 The Rookery.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meet ings on the third Wednesday in each month, at the Great Northern Hotel. Chicago, Ill.; secretary, S. T.Johnstone, 1522 Monadnock building.

The Technical Society of the Pacific Coast has a month y meeting on the first Friday in each month at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at he Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its in formal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading nd discussion of papers on the first Wednesday of each month except January.

PERSONAL.

The receivers of the Galveston, LaPorte and Houston Railway have appointed C. F. Byers general freight agent.

The directors of the Peoria and St. Louis Railroad recently met and elected Lewis H. Thomas of Thomasville president.

Mr. A. J. Ratcliffe has been appointed traveling passenger agent of the Union Pacific, with headquarters in Indianapolis.

Mr. R. B. Luther has been appointed commercial agent in Kansas City for the Baltimore & Ohio. He will look after western dairy products.

Mr. G. G. Lynch has been appointed assistant superintendent of transportation of the Atlantic Coast Line with headquarters at Florence, S. C.

Mr. Walter G. McRae has been appointed chief engineer of the Carolina, Tennessee & Ohio, under contract from Wilmington to Southport, N. C.

Mr. Henry Steinhoff, formerly ticket agent of the Michigan Central at West Saginaw, Mich., has been appointed traveling passenger agent of the Wisconsin Central.

Mr. W. E. Beals, secretary to superintendent H. A. Worcester of the Lake Shore, has been made division claim agent. Mr. Wm. Harley succeeds him as secretary.

Mr. Peter Carroll has been appointed foreman of bridges and buildings of the Missouri Pacific, with headquarters at El Dorado, Kas., to succeed Mr. C. W. Kyser, resigned.

Mr. J. T. Slatter is appointed general freight and passenger agent and auditor of the Chattanooga Southern, vice Mr. H. r'. Eager, resigned. Appointment effective August 1.

Mr. T. W. Parker has been appointed traveling freight and passenger agent of the Chicago, Paducah & Memphis with headquarters at St. Elmo, Ill., appointment effective August 1.

Mr. W. B. Turner, for some time past signal engineer of the Western Indiana road, has been appointed commercial agent of the Vandalia line, with headquarters at Fort Worth, Texas.

Mr. M. D. Royer, for some years one of the several auditors of the Illinois Central, is now general traveling auditor of that road and is making his first trip over the line in that capacity.

Mr. Cyrus Garnsey, Jr., heretofore auditor of the Kansas City, Memphis & Birmingham at Memphis, Tenn., has been appointed assistant controller, with headquarters at Kansas City, Mo.

Mr. C. A. Robinard, formerly chief train dispatcher at Ottawa, for the Canadian Pacific Railway, has been appointed acting superintendent of the Ottawa division of the same road to succeed Mr. H. B. Spencer, resigned.

Mr. T. W. Hincholiffe has resigned as general manager of the Litchfield, Carrollton & Western, and will be succeeded by Mr. B. F. McCall. Mr. E. W. Clifford, general freight and passenger agent of the same road has also resigned.

Mr. D. W. McLean, master car builder for the Memphis Railway at Fort Scott, Kas., died a few days ago at Grand Rapids, Mich., after a protracted illness. He formerly had charge of the car department of the Missouri Pacific Railway.

Mr. Wm. A. Davis, chief engineer of the electric plant of the Union Railway Co., Indianapolis, has resigned his position, and is succeeded by Michael Eagin, formerly chief engineer of the Citizen's Street Railway plant at that point.

Mr. A. L. Studer has been appointed master mechanic of the southwest division of the Chicago, Rock Island & Pacific with headquarters at Trenton, Mo. Mr. Studer has charge of the locomotive department vice Mr. William Gessler resigned.

Mr. W. S. Wilson, assistant superintendent of the St. Louis division of the Illinois Central, after twenty-eight years' service on the road which was formerly well-known as the Cairo Short Line, has resigned, effective August 1, to engage in other business.

Mr. L. J. Ferritor has resigned as chief dispatcher and train master of the Omaha & St. Louis line, and has gone to Stratford, Ont., to take a position as assistant division superintendent on the Grand Trunk. He will be in charge of the lines between Stratford and Buffalo, N. Y.

Mr. George Zoeller, who has for the past five years been the superintendent of the Chattanooga division, for the Pullman Palace Car Co., has resigned. His successor is Mr. H. S. Twinam, of Philadelphia. Mr. Zoeller has become associated with the Kentucky Jellico Coal Co.

Mr. J. B. Kilpatrick has been made master mechanic of the West Iowa division of the Rock Island road with headquarters at Valley Junction, Ia. Mr. Kilpatrick is already master mechanic of the Keokuk & Des Moines and Des Moines & Fort Dodge and assumes his new duties in addition.

Mr. Walter B. Brockway has been appointed auditor of the Toledo, Bowling Green & Fremont Electric Railroad. For six years Mr. Brockway has been connected with the auditing department of the Ohio Central. Previous to that time he was an accountant in the general office of an eastern road.

It is currently reported that Colonel W. F. Snyder, who has for so long a time represented the Big Four in St. Louis as general western agent of that company, and retired from the service about three months ago when that office was abolished, will, the first of the month, receive an appointment to a position in the traffic department of the Baltimore & Ohio system.

Mr. Edward A. Eckert, superintendent of exchanges of the Metropolita n Telegraph & Telephone Co., died July 26 at Asbury Park, N. J., aged 54. He was sick only 35 minutes, and was in his room when attacked. Superintendent Eckert was injured three weeks ago by falling from his bicycle. Mr. Eckert was a brother of Mr. Thomas Eckert, president of the Western Union Telegraph Co.

Mr. W. C. Nixon, for a number of years past agent of the local freight station of the Santa Fe in Chicago has been appointed general agent of the freight department of that company with offices at No. 212 Clark street, vice Mr. T. M. Orr, assigned to other duties. Mr. C. B. Strohm heretofore trainmaster of the Chicago division of the Santa Fe at Chillicothe, succeeds Mr. Nixon as local freight agent and superintendent of terminals at Chicago.

Mr. W. W. Wheatley, car accountant of the West Shore, has resigned, to become superintendent of the Brooklyn Heights Trolley Line. Mr. Wheatley has been on the West Shore since 1884, beginning at Syracuse as chief dispatcher of the Buffalo division; since 1890 he has been car accountant at Weehawken. He is 38 years old, a man of marked executive ability and is now secretary of the New York Railroad Club.

Mr. W. E. Coffin, for six years foreman of the Texas & Pacific Car Works at Marshall, has resigned to take effect August 1, to accept a position with the Cleveland Malleable Iron Co., of Cleveland, O., as traveling agent. Mr. J. R. Herndon, car foreman at Longview Junction, will succeed him. Mr. Coffin has been with the T. & P. for about ten years. He is the patentee of the Coffin sill and Corlin pockets, used by the T. & P., and several other roads.

At the recent meeting of the directors of the Columbus, Hocking Valley & Toledo Railroad Company, Mr. James T. Boothroyd rendered his resignation as the assistant secretary of the company, which position he has filled since January, 1890, with headquarters in New York. The resignation was accepted and the board elected Mr. John L. Nisbet to be his successor. Mr. Nisbet will have his office with Vice President Samuel B. Davis in New York, and his duties will consist of that portion of the secretary's work which transpires in that city.

The announcement that Mr. John S. Beale, for many years Marion representative of the Columbus, Sandusky & Hocking has been appointed to succeed General Passenger Agent B. H. Akin, has been made. Under the former Guerin regime Mr. Beale was assistant general passenger agent, but after the receivership and the election of Mr. Monsarrat to the presidency, Mr. Beale was given the Sandusky office. Now that Mr. Guerin is again at the head of the road he has made Mr. Beale the chief of his passenger department. Mr. Beale has been with the road since the building of the northern end of it, and is regarded as one of the most efficient and faithful passenger men in the state.

Mr. John A. Jackman, one of the pioneer railway men of the country, died at Bloomington, Ill., July 29, aged 80. He was born in Boscawen, N. H., and began his railway life as station agent of the Boston & Worcester line, now Boston & Albany, in 1837. Soon afterwards he entered the machinery department, in which he rapidly rose to distinction. In 1852 he, with E. B. Phillips, who had been superintendent of the Boston & Worcester, took charge of the Toledo & Cleveland Railway, Mr. Jackman as superintendent of machinery, stationed at Norwalk, O. In 1859 he became superintendent of machinery of the Boston & Worcester at Boston. In 1864 Jackman went to Bloomington and became superintendent of machinery of the Chicago & Alton. In this position for fifteen years he did most efficient service.

Mr. Robert Garrett, for many years president of the Baltimore & Ohio road died at his cottage at Deer Park, Md., on Wednesday of this week. Mr. Garrett was born in Baltimore April 9, 1847. His first connection with the railway service was his election by family interests to the presidency of the Valley road in June, 1871. Oct. 8, 1879, he was elected third vice-president of the Baltimore & Ohio, July 13, 1881, was made first vice-president and upon the death of his father in the fall of 1884 he assumed the presidency, which he resigned on Oct. 12, 1887. Although he has been an invalid for many years it was not thought that his physical infirmities were such as to cause any immediate uneasiness upon the part of his friends. About two weeks ago, however, he began to fail and it was thought best to remove him from "Uplands," his country home near Baltimore, to Deer Park, in the hope that the change of air and scenery would benefit him. The improvement was not as great as his physicians had hoped for and within the past week the patient has suffered much from mental depression and melancholia. On Monday his physical condition showed a marked change for the worse and Tuesday his condition became critical, terminating fatally on Wednesday.

RAILWAY NEWS.

Canadian Pacific.—A Buffalo, N. Y., paper says: "The Canadian Pacific R. contemplates the early extension of its Vaudreuil & Rigaud line to the capital of the dominion. The company's engineer, Mr. Hugh D. Lumsden, has been making preparations for some time past to build a portion of the Montreal & Ottawa line between Rigaud and a point near Alfred, a distance of 28½ miles, and the whole section will be covered immediately by large gangs of men, as the Canadian Pacific officials are desirous of having the section completed by the end of November. The new railway offers no serious engineering difficulties, and after leaving Rigaud will pass through St. Eugene, Vanleck Hill and Caledonia Springs into Alfred."

A statement has been made that the Canadian Pacific has entered into an agreement with the Qu'-Appelle, Long Lake & Saskatchewan Railway for a period of five years. The company has been operating this road almost from the start, and the directors have power from the shareholders to enter into a fresh arrangement should that be deemed necessary. There probably will be a further term of years agreed upon, even if the statement is premature at this time as claimed.

Cassville & Western.—Five miles of the Cassville & Western road is now completed and some rolling stock has already been purchased. The whole length of the proposed line will be 62 miles, and will extend from Cassville to Harrison, Ark. The part finished joins the two towns of Cassville and Exeter, Ark., and at the latter place forms a connection with the St. Louis & San Francisco. Mr. J. M. Bayless of Cassville, is president and general manager and also the principal owner of the road. Chief Engineer Bond, of the St. Louis & San Francisco, made the surveys for the road and ran a preliminary line to Harrison. Mr. D. L. Mitchell is secretary and Mr. J. M. Stull, engineer of the new company.

Chesapeake & Ohio Southwestern.—As advertised, the Chesapeake & Ohio Southwestern was sold under foreclosure at Louisville, Ky., at noon on July 25, by Commissioners John Young Brown and John Baskin. The Illinois Central, through its General Manager J. T. Harahan bid it in for $1,500,000. The road runs from Louisville to Memphis, Tenn., and has 492 miles of track.

Chester Valley.—The bondholders of the Chester Valley road, which is now in process of being sold under foreclosure by the court, are negotiating with the reorganization managers of the Philadelphia & Reading, in order to effect a settlement of the claims of the former road. It is said that a proposition has been made to pay to the bondholders of the Chester Valley the back interest on the first mortgage 5 per cent bonds at the rate of 4 per cent per annum, the new Reading company to guarantee that rate of interest in the future. The interest on these bonds has been in default since April, 1895. As to the second mortgage bonds, it is proposed to reduce the annual rate of interest from 4 to 3 per cent. The amount of outstanding first mortgage bonds is $280,510, and of second mortgage bonds is $100,000. The road has not been earning its fixed charges recently.

Coast Railway of Nova Scotia.—The Coast Railway of Nova Scotia, when completed, will be 90 miles in length, extending from Lockport along the south shore of Nova Scotia and connecting at Yarmouth, the western terminus, with the Dominion Atlantic Ry. and Yarmouth Steamship Co. The entire line has been surveyed and 14 miles of track laid to Belleville. Mr. John A. Brill of Philadelphia is the president of the company, Mr. George A. Fletcher treasurer, and Mr. L. H. Wheaton chief engineer. The Nova Scotia Development Co. are the contractors.

Duluth & Winnipeg.—The Duluth & Winnipeg road was finally sold at Superior, Wis., on the morning of July 25, by Capt. Edward Simonton, of St. Paul, master commissioner appointed by the court. As was expected, there was one bidder only, Mr. John A. Garver of New York, who represented the reorganization committee of the bondholders. The property was purchased in the name of John W. Sterling, John A. Garver, M. W. Church and Chas. Steele, of New York. Their bid, the only one, was $2,373,719.44, and the property went to them at that figure. The bondholders are Canadian Pacific people, and that road now becomes the possessor of the Winnipeg road. It is said to be practically certain that it will be extended to the boundary in the near future, and there is a plan for tapping the Mesaba iron range in order to receive a share of the ore traffic which is very profitable.

Grand Trunk.—An official circular has been issued by Mr. George B. Reeve, general traffic manager of the Grand Trunk, as follows: Taking effect August 1, 1896, the European Traffic Agency, 25 Water street, Liverpool, England will be closed, as will also the sub-agencies at Manchester and Glasgow. All correspondence heretofore addressed to Mr. Robert Quinn on freight and passenger matters should be addressed to the heads of those departments, namely, Mr. John W. Loud, general freight agent, Montreal, and Mr. W. E. Davis, general passenger and ticket agent, Montreal.

Intercolonial.—The Dartmouth branch of the Intercolonial (government) Ry., 14 miles from Windsor Junction to Dartmouth, Halifax county, was opened for traffic July 22, 1896.

Northern Pacific.—The entire system, rolling stock, bonds, securities, of the old Northern Pacific R. Co. was bid in Saturday morning, July 25, at the sale under Special Master Carey, at the company's depot at Superior, Wis., President E. W. Winter bidding it in on behalf of the new Northern Pacific. When the parties were gathered ready to proceed with the sale, M. D. Grover of St. Paul, general counsel of the Great Northern, to preserve the rights of his corporation, gave notice that the purchasers would be held subject to the lease of the St. Paul & Manitoba, which the Northern Pacific uses between St. Paul and Minneapolis. Charles L. Cattlin, of Superior, notified prospective bidders that the St. Paul & Tacoma Lumber Co. held the purchasers to contract in Pierce county, Washington, to purchase 80,000 acres of land and transport the timber to Tacoma. These formalities over, at 10:30 Special Master Carey mounted the depot platform and read to the hundreds of persons gathered the notice of sale under the decree of Judge Jenkins. He first offered the entire railroad and appurtenances from the eastern terminus of Lake Superior to Portland, Ore., with its rolling stock, making a special provision not before published and offering, subject to the same terms and conditions, the property acquired by the receivers in the road's name. President Winter then on behalf of the Northern Pacific R. offered $10,000,000. He then deposited with the special master, the Farmers' Loan & Trust Co.'s receipt for the amount of bonds necessary to bind the sale, which Carey receipted. The first parcel was knocked down to the Northern Pacific for $10,000,000, there being no other bid. The second parcel, consisting of all the stocks and bonds of branch lines, held under the consolidation mortgage was then offered and likewise bid in by Edwin W. Winter for the Northern Pacific, and the formality of receipting for the earnest money was gone over. The third parcel, embodying the franchises of branch lines, was offered and taken by Winter for $500,000 without opposition. The party then adjourned to the county courthouse, and at noon offered the Northern Pacific lands in the state of Wisconsin. President Winter was again the purchaser, and took the entire list of 31 sections, making the necessary deposit of par value of general second mortgage bonds and bid $100 per section. Special Master Carey then offered all patented lands in Wisconsin not included in the former list for any reason, and received a bid from Winter on behalf of the Northern Pacific of $1,000. The third and last parcel offered was the list of lands granted by the United States to the Northern Pacific R. to aid in the construction and equipment of its line, upon which patents have not been issued, but to which the road is entitled. Mr. Winter bid $500,000 and got it without opposition, and the sale was over. The managers stated that no change in the operation of the line was contemplated. On Monday, 27th, at Mandan, N. D., the Northern Pacific lands west of the Missouri river were sold. They were also bought by President Winter for the Northern Pacific P. Co. for sums aggregating $600,000. While the bids for the three parcels sold Saturday were up to the amount demanded by the decree of sale, that sum by no means represents what the new company will have to pay for the property. In addition to the other obligations that are imposed, the purchaser is required to pay to the bondholders of 138 of the general second mortgage bonds the sum of $1,000 for each bond, together with all coupons and interest that may be due; to the holders of 159 of the third mortgage bonds the sum of $650 per bond of $1,000, and to the holders of 579 of the consolidated mortgage bonds $350 per bond of $1,000. The purchaser must also pay all the costs and expenses of the sale. The sale of this property has been confirmed by Judge Seaman in United States court. The decree of confirmation provides that as soon as the deeds have been executed the receivers shall give possession to the purchasers. Attorney Cromwell, who represented the Northern Pacific reorganization committee in the matter, stated that he expected that the road would be operated by the new management by the middle of August. He was of the opinion that there was nothing that could prevent the reorganization going through.

Oregon Improvement Co.—The first mortgage bondholders of the Oregon Improvement Co., have brought suit at Seattle, Wash., for the foreclosure of the mortgage and the appointment of a receiver. Suits had also been brought by the holders of the consolidated bonds, and Judge Hanford ordered all these suits consolidated and appointed Mr. C. J. Smith, the present receiver, as receiver also under the new suit.

Considerable work is being done between Seattle and Franklin on the Columbia & Puget Sound Shore, filling in trestles with rock and getting out new ties, and otherwise preparing the roadbed for standardizing the line. A force of over 100 men are at present at work on these improvements. A large quantity of unused Port Townsend Southern rails, recently brought to Seattle from Port Townsend, are being distributed along the line. The apparent intention to standardize at once has revived talk of the possible building of a new four mile piece of road to connect Franklin with Palmer on the Northern Pacific, but railroad officials say there is no intention to cover the gap at present.

Oregon Railway & Navigation Co.—Another official step toward the reorganization of the Oregon Railway & Navigation Co. has been taken by the filing in the office of the county clerk of articles of incorporation of the Oregon Railway & Navigation Co. The capital stock is $35,000,000, divided into $24,000,000 common and $11,000,000 preferred. The company is to operate the lines of the former system, both rail and water, and to build all the lines contemplated by the former company. The preferred stock is to be entitled to receive dividends, if declared to the amount of four per cent per annum, non-cumulative, before any dividend shall be paid on common stock. The common stock is to be entitled, after the payment of four per cent dividends declared during the same year, up to four per cent per annum and, after the payment of such dividends to the common stock all dividends declared during the year are to be distributed pro rata to the preferred and common stock. The preferred stock is not to be increased without the consent of the stockholders of the corporation. A rumor is current in western railroad circles that Collis P. Huntington and the Southern Pacific people have a hand in the new government of the Oregon Railway & Navigation Co., which will, on Aug. 1, be transferred from the jurisdiction of the federal courts. It is believed that Huntington has, indirectly or otherwise, obtained a share in the controling power on the purchasing committee appointed by the reorganization board at New York to acquire the Oregon corporation's property.

Ottawa, Arnprior & Parry Sound.—The work at the divisional point of the Ottawa, Arnprior & Parry Sound Railway, at Madawaska, 130 miles west of Ottawa, is progressing nicely, some 150 men being employed in laying side tracks and in the erection of a depot, engine house and other buildings where the company has secured 700 acres for divisional purposes. By the middle of September trains may be run through, without change, from Ottawa to this point. Much of the lighter work on the 47 miles contract, between Cache Lake and Emsdale, has been completed and the heavy rock work is well in hand. Track has been laid, on this new section some three miles to the head of Cache Lake. The work of filling in of trestles and ballasting between Barry's Bay & Cache Lake is being pushed by Mr. Jos. Leslie the roadmaster. At Ottawa, the eastern terminus, work on side tracks crossing the north basin of the Rideau Canal and preparing a portion of the military stores building for a temporary depot, bringing trains in to within 100 ft. from the proposed site for the new central depot, is in progress.

South Atlantic & Ohio.—The United States court at Abingdon, Va., on July 24, ordered the sale of the South Atlantic & Ohio R., which runs from Bristol, Washington county, on the Tennessee border, to Big Stone Gap, in Wise county, a distance of 66 miles. The double tunnel at Big Stone Gap is ordered to be sold in four months, and the celebrated natural tunnel, one of the greatest curiosities of the continent, goes to sale with the railroad.

West Virginia Central & Pittsburgh.—Final surveys are now in progress in Allegheny and Washington counties, Maryland, for the extension of the West Virginia Central & Pittsburgh R. between Cumberland and Hagerstown. This line was projected and located the latter part of last year, and a considerable of the right of way secured. It is understood that a contract has been made with the Pennsylvania and Cumberland Valley roads in which "they agree to prorate on favorable terms with the Baltimore & Cumberland and to reserve 5 per cent of the gross revenue derived from the interchange of traffic with that road to be applied if necessary toward the payment of the interest on its bonds." It is also said that the West Virginia Central management hopes to get control of the Western Maryland R., which would give it a direct outlet to tidewater.

NEW ROADS AND PROJECTS.

California.—It is said that the Ojai Valley road is now an assurred fact and that its construction will begin not later than September 1 of this year. A subsidy of $10,000 has been given by the inhabitants of the valley, and the necessary right of way secured. The connection with the outside world which the construction of this road will give to the valley will be of infinite benefit to farmers and fruit-growers, while to the traveling public it will open new privileges and new delights. It is thought that this Ojai valley is spacious enough to in a measure preserve its quiet and its wild picturesqueness, even though a train of cars glide through it several times a day. The construction is in charge of Captain Cross.

Georgia.—There is a prospect of a railway from Luverne, Crenshaw county, Ala., to connect with the Mobile & Girard Railroad at Glenwood, giving a direct line to Savannah, Ga., and securing for Luverne a more direct way for the shipment of cotton. It is considered that it is in no sense a matter of dollars and cents, as there is sufficient money to build the seven miles of road and equip it with sufficient rolling stock to meet the fall demand. It is estimated that at least 3,000 bales of cotton could be handled by the road this year. This alone will be of interest to the Central, as they will secure the hauling of the cotton on to Savannah. The Central of Georgia which operates the Mobile & Girard road is said to look favorably upon this plan and doubtless will be ready to assist in the matter.

The project of building a railroad from Atlanta, Ga., to Selma, Ala., under the name of Atlanta & Alabama is being revived and, it is stated, that construction may begin soon. The road is intended to be built from Atlanta to Selma, Ala., about 175 miles in length. Mr. R. M. Mitchell of Atlanta is general manager and the chief promotor of the enterprise.

Illinois.—It is stated that the prospects are good for another railroad to form another line from the Chicago, Milwaukee & St. Paul at Harvard, Ill., along the west shore of Geneva Lake to Delavan or Elkhorn, Wis. The people residing at Walworth, Fontana, and Delavan, Wis., through which places the proposed line if built will pass, are anxious to have the road and will give liberally towards its construction. It is rumored that the backing of this new enterprise is Mr. Charles T. Yerkes of Chicago. The telescope and observatory which he presented to the people of Geneva, Wis., could be reached easily by this new line while it would make a great outlet for the coal that is produced in western Illinois.

Michigan.—A project is said to be on foot to build a steam railroad from Standish to Point Lookout via Au Gres, all in Arenac county, with the intention of ultimately extending the line to Alabaster, Iosco county, where plaster beds would furnish considerable freight.

An estimate has been made that the road can be graded for $10,000, the ties bought for $9,000, bridges $6,000, culverts $3,000, and the iron for $22,000, making the total cost of the road $50,000.

Missouri.—Articles of incorporation have been filed at Jefferson City, Mo., for the Kansas City & Eastern R. Co. of Kansas City. The plan of this new company was given in detail in our issue of May 30, which briefly stated is as follows: The company has a capital stock of $1,500,000, and is formed for the purpose of constructing and operating a standard gage road from Pattonsburgh to Trenton, Mo., a distance of 34 miles, and also to purchase and operate the Quincy, Omaha & St. Louis R. (extending from Quincy, Ill., to Trenton) and the Omaha & St. Louis R., running from Pattonsburg to Omaha. The main object in view is to secure a continuous line of road from the Missouri river to competitive points on the Mississippi.

Texas.—Surveyors have run a line from the Missouri, Kansas & Texas tracks in Ft. Worth, Tex., to the stock yards for the first section of the new belt line which is projected to encircle the city and connect various industries in the outskirts. It is stated a portion of the road will be in operation within 60 days. St. Louis and other parties are interested in the company. Hon. B. B. Paddock and C. H. Lilliman, of Ft. Worth are directors in the company.

INDUSTRIAL NOTES.

Cars and Locomotives.

—The contract between the Georgia Railroad Co. and the Ohio Falls Car Works provides for the construction of 200 box, 10 stock, 50 flat and 65 coal cars.

—The Lebanon Mfg Co. has secured a contract for the construction of 500 gondola cars for the Philadelphia & Reading Railroad.

—The Butler & Pittsburgh Railroad will, it is stated, be in the market in a short time for a large number of ore cars and locomotives, the intention being it is said, to spend about $4,000,000 on equipment.

—The Greensboro & Ore Hill Railroad, Greensboro, N. C., will order locomotives and freight cars; Hal M. Worth manager.

—The Wells-French Co. is reported as having secured the contract for the 100 refrigerator cars for Swift & Co., of which mention has already been made in these columns.

—The Southern Pacific is securing bids on 10 box and 20 flat cars—not a very big order for a company of that size.

—The Rhode Island Locomotive Works, Providence, R. I., having completed all contracts, closed on the 20th inst. for an indefinite period, by order of the committee of its creditors, which controls the concern on a five year extension from February, 1896. A plan is on foot to reorganize the company with New York and Providence capital.

Buildings.

It is rumored that the Texas & Pacific Railroad and the Grand Isle road will build a new union depot at New Orleans, La.

—The Detroit & Mackinac Railway Co's. new repair and car shop will be located at West Bay City, Mich. All new machinery will be put in.

—As soon as a suitable site can be found a new plant will be erected at Port Richmond, Staten Island, N. Y., by the King Drop Forge Co., which will be equipped with considerable new machinery. The capital stock of this new concern is $300,000. Mr. Lincoln King is president, W. Scott King, vice president; A. Morris Hall, secretary, and Chas. H. Ingalls, treasurer.

—The plans for the open hearth steel plant at Sharon, Pa., have been enlarged, and it is likely that the plant will be one-half larger than at first proposed. The production will be 1,000 tons per day, and the main building will be 915 x 320 ft. in size. Work has already been commenced and a number of the company's houses near the location are being removed.

—It is reported that the Illinois Central Railroad Co. proposes to erect a hotel at Frenier, La., about 23 miles from New Orleans. The Raymond & Whitcomb Excursion Co., of New York City, is said to be interested in the project.

—Extensive improvements have been commenced at the Michigan Central Railroad shops, St. Thomas, Ont., Can. New roofs are being put on all the buildings. Smoke stacks will be renewed, pneumatic hoists put in for all the large machines, and a lot of new and up-to-date machinery will shortly be added.

—Building permit has been issued to the Nashville, Chattanooga & St. Louis Railroad Co., for repairs to union depot at Chattanooga, to cost $8,000.

—John R. Davies, of Chicago, has been conferring with the Young Men's Business League, of Chattanooga, Tenn., relative to establishing a plant for making car wheels.

—The shops and general offices of the Texas Midland Railroad will probably be located at Terrell, Tex. Mr. E. H. R. Green, its president, made the citizens of Terrell a proposition to the effect that if they would furnish the ground on which to build the shops, yard and office buildings he would make Terrell the headquarters of his road. Pursuant to a call of Major Grinman, president of the board of trade, a mass meeting of citizens was held to consider the liberal proposition of Mr. Green. The ground required for the purpose will cost about $7,000. Six thousand dollars has already been raised and the balance is expected to be subscribed by property owners who reside at a distance and have interests here that will be greatly benefitted if the shops and offices are secured.

—Excavations are being made near Connellsville, Pa., preparatory to the erection of a smelting furnace for refining brass, copper and other high grade metals. Besides the refining plant a part of the works will be devoted to the cleaning of old waste and recovering the oil. Two mills, 40 x 100 ft., will soon be in course of construction, and before long two more like buildings will be erected. The Pittsburgh Bridge Co. has the contract for the erection of the mills.

Bridges.

—Bids are asked until Sep. 2, for the constructing the substructure of a bridge on the line of the Elgin, Joliet & Eastern Ry. in Will county, bond $5,000; also the superstructure, bond $12,000; superstructure for the Western av. boulevard bridge at Southwest boulevard and the main channel, bond $10,000, and also the substructure of this bridge, bond $5,000.

—Bids will be received until August 12, for the construction of the Howe truss bridge in Cleveland, Ohio, over the tracks of the C. & P. railroad and the L. S. & M. S. railroad at Sebeca street from Seneca street extension to Lake Erie.

—Plans are being prepared for raising the approach to the overhead bridge at East Conemaugh, Pa. There will be about 1,500 cu. yds. of second class masonry, about 1,300 cu. yds. of excavation and about 2,000 cu. yds. of filling. Bids will probably soon be received.

—The new highway bridge across the Connecticut river connecting Middletown with Portland, Conn., is now swung by electricity. The electrical equipment consists of four General Electric 800 motors. Two of these are connected with the swinging mechanism, one working and the other being held in reserve. Of the other two, one is located under each end of the turning span, to raise it from the fixed piers before the third motor begins to swing it. The bridge span is 450 feet long—the longest single span highway bridge in the world. Previous to the installation of this electrical equipment by the General Electric Co., 15 men were required to start the bridge and and eight men to swing it.

—Considerable trouble has been experienced in securing the necessary right of way for the approaches of the new Missouri river bridge at Yankton, but by the time the contracts are let it is expected that this matter will have been fully settled. General Manager Miller, who has just returned from the east, where he went to negotiate with the Chicago & Northwestern Railway Co. for the right of way across a portion of its land and the use of one of its tracks, sets at rest all doubts concerning the character of the structure to be built with the statement that it will be a combination wagon and railroad bridge, and that the grades at either side of the river will require only slight changes. A corps of engineers is now at work on the Yankton & Norfolk grade on the Nebraska side of the river.

Iron and Steel.

—The plant for the manufacture of fish plates for the purpose of connecting joints on railway tracks, recently patented by Col. C. O. Howell of Washington, D.C., will be located in Greensburg, Pa., probably in the old nut and bolt works. The works will employ from 150 to 200 men.

—A strike has occurred among 300 puddlers, heaters and rollers in the rolling mill department of the United States Car Company at Anniston, Ala., which threatens to become serious. On July 1 the new wage scale increasing prices from $4 to $4.50 per ton went into effect. The company agreed to pay the new scale but did not sign it, and the men claim they held back 2 per cent of their wages for an insurance fund. The company has given discharge notices and say the strikers are forever barred from the mill.

—The furnace at Talladega, Ala., formerly operated by the Talladega Iron & Steel Company, has been sold by Captain W. P. Armstrong of Selma, its latest owner, to the Alabama Iron & Railroad Company.

—The Tyler Tube & Pipe Company, Washington, Pa., manufacturers of knobbled charcoal iron boiler tubes, special boiler tubes and knobbled hammered charcoal iron blooms, have been awarded a contract by the United States government for the knobbled charcoal iron boiler tubes for the United States war vessels New York, Columbia, Minneapolis, Castine, and the ram Katahdin. This is said to be one of the largest contracts ever let of this kind, and embraces over 30,000 high grade tubes. Sixty days are allowed in which to complete the contract. The Tyler Tube & Pipe Company has recently made a large addition to its plant, consisting of two lap weld furnaces which are said to be among the largest in the country. The entire product of the Principio Forge Company of Wheeling, W. Va., manufacturers of knobbled hammered charcoal iron blooms is consumed by the Tyler Tube & Pipe Company of Washington, Pa., for making charcoal iron boiler tubes.

—The Carnegie Steel Company has concluded the deal with the Oliver heirs, for the purchase of 40 acres of land at Duquesne, Pa., to cost $200,000. The ground, it is understood, will be used as a site for the new forging plant the company proposes to erect at a cost of $1,000,000.

—The New York Car Wheel Works of Buffalo, N.Y., has established a branch of its works in Buda Pesth, Austria-Hungary, and the making of wheels on the "Griffin system" has already commenced. The plant employs at present 150 men and it is expected to increase the number at an early date.

—A dispatch from Pittsburgh says the outlook in the iron and steel industry is more encouraging than at any time since the stoppage of the mills. President M. M. Garland of the Amalgamated Association said that 60 firms have signed the wage scale prepared by the organization at the annual convention held in Detroit. All of the sheet mills recognizing the union, about 30 in number, are paying union rates and are in operation. Many of the companies operating tinplate and rolling mills have agreed to the terms of the Amalgamated Association. Mr. Garland believes the others will be in line as soon as the necessary repairs are made at the works.

Machinery and Tools.

—The Westinghouse Electric & Manufacturing Co. has received a contract from the Baltimore, Cantonsville & Ellicott City Railway Co. for thirty-two 100 horse power and twenty 30 horse power electric motors for its new railway. The heavy motors will be used for long runs between Baltimore and Washington, and the smaller ones for short runs in the city.

—The Bickford Drill & Tool Co. of Cincinnati, Ohio, on the 10th instant moved to temporary quarters, corner of front and Lawrence streets, pending the erection of its new building, work upon which has been commenced and is now in progress at its old site corner Front and Pike streets. The new building will be a brick structure four stories high, having a frontage of 75 feet on Front street and a depth of 125 feet on Pike street. The equipment will be of the most modern, and will comprise all the conveniences that skill and ingenuity can devise for the more perfect and rapid production of the specialties of the company. It is expected that the work will be completed within three months.

—Cyrus Robinson, engineer and manager of the mining department of the Jeffrey Manufacturing Co., Columbus, Ohio, has resigned his position to accept the management of J. H. McEwen & Co., with headquarters at New York City.

—New automatic rail loaders designed to carry 60 foot rails are being erected at the rail mills of the Pennsylvania Steel Co., Steelton, Pa.

Miscellaneous.

—The Sweet & Clark Co., at Marion, Ind., has made an assignment. The company was incorporated ten years ago, succeeding the Sweet & Clark Mfg. Co. of Troy, N.Y., and was capitalized at $100,000 and mortgaged for $75,000.

—After exhaustive experiments in the use of liquid fuel for war ships it is announced that Engineer-in-Chief Melville has concluded that petroleum does not give as good results as ordinary coal, and its use in the navy is not to be recommended.

—The Phosphor Bronze Smelting Co., Philadelphia, has recently secured the right to manufacture Delta metal in the United States. It is now placing it on the market in rods, plates and heavy castings.

—W. J. Thackston, Greenville, S. C., wants to obtain approximate estimate of cost of an incline passenger road 2,000 ft. long and a rise of 600.

—The Middletown Car Works having passed into the hands of a receiver, the prospect is that the car manufacturing industry of Dauphin county, Pennsylvania, which several years ago employed over 1,200 men in Harrisburg, Dauphin and Middletown, will soon be only in name. The Harrisburg works for many years yielded immense profits to the stockholders, but to-day, owing to sharp western competition, they are idle, with no prospect of resumption. The Dauphin works are in a similar condition. The Middletown works have recently encountered financial difficulties of a serious nature, and the creditors of the company and the corporation have reached an agreement by which the concern will hereafter be conducted under the supervision of a receiver. Among the principal creditors are the Susquehanna Iron Co. of Columbia, which has a claim of $4,590, and the Pennsylvania Nut & Bolt Works of Lebanon, whose claim amounts to $4,200. The aggregate indebtedness of the works is $57,600, while the value of the establishment is placed at $100,000. The products on hand and contracts on the books are put at $18,000. Arthur King, principal owner of the works, has been appointed receiver with a bond of $32,000. The number of men employed is about 200. The company has had trade with Brazil, San Salvador, Cuba, Mexico and South Africa, but its principal business has been in Pennsylvania.

—The Stillwell-Bierce & Smith-Vaile Co. of Dayton, O., has closed a contract with a Montreal company for water wheels which amounts to $500,000. Thirty-four wheels inside iron flumes are to be employed, and the 21,000 horse horse power generated is to be conveyed electrically to Montreal.

—The Pittsburgh Reduction Co., Pittsburgh, Pa., has just rolled some aluminum plates, 94x94 in., for the United States government. One of the sheets after rolling was 150x100¼ in., which is said to be the largest sheet of aluminum ever rolled.

—The contract will soon be let for the erection of the largest by-product coke plant in the United States, to be located at McKeesport, adjoining the National Tube Works. The capital to be invested will be about $1,000,000. which is being furnished by the Union Gas Co. of Philadelphia. Forty acres of ground have been leased near the tube works, involving the tearing down of more than 100 dwellings. It is intended to erect 120 Otto Hoffman by-product coke ovens on this property. The advantage of these ovens will be appreciated when it is stated that the coke costs practically nothing, as the money made in the saving of by products will pay for the burning of the coke.